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City of Cambridge

THE

FOURTEENTH ANNUAL R

OF THE

CAMBRIDGE WATER

THE CITY COUNCIL

TOGETHER WITH

REPORTS OF THE REGISTRAR [illegible]
AND OFFICERS [illegible]

FOR THE YEAR 1878.

[illegible]
CAMBRIDGE [illegible]
[illegible]

City of Cambridge

THE

FOURTEENTH ANNUAL [illegible]

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL

[illegible]

REPORTS OF THE REGISTRAR [illegible]
AND OTHER [illegible]

FOR THE YEAR [illegible]

BOSTON:
FRANKLIN PRESS: RAND, AVERY, [illegible]
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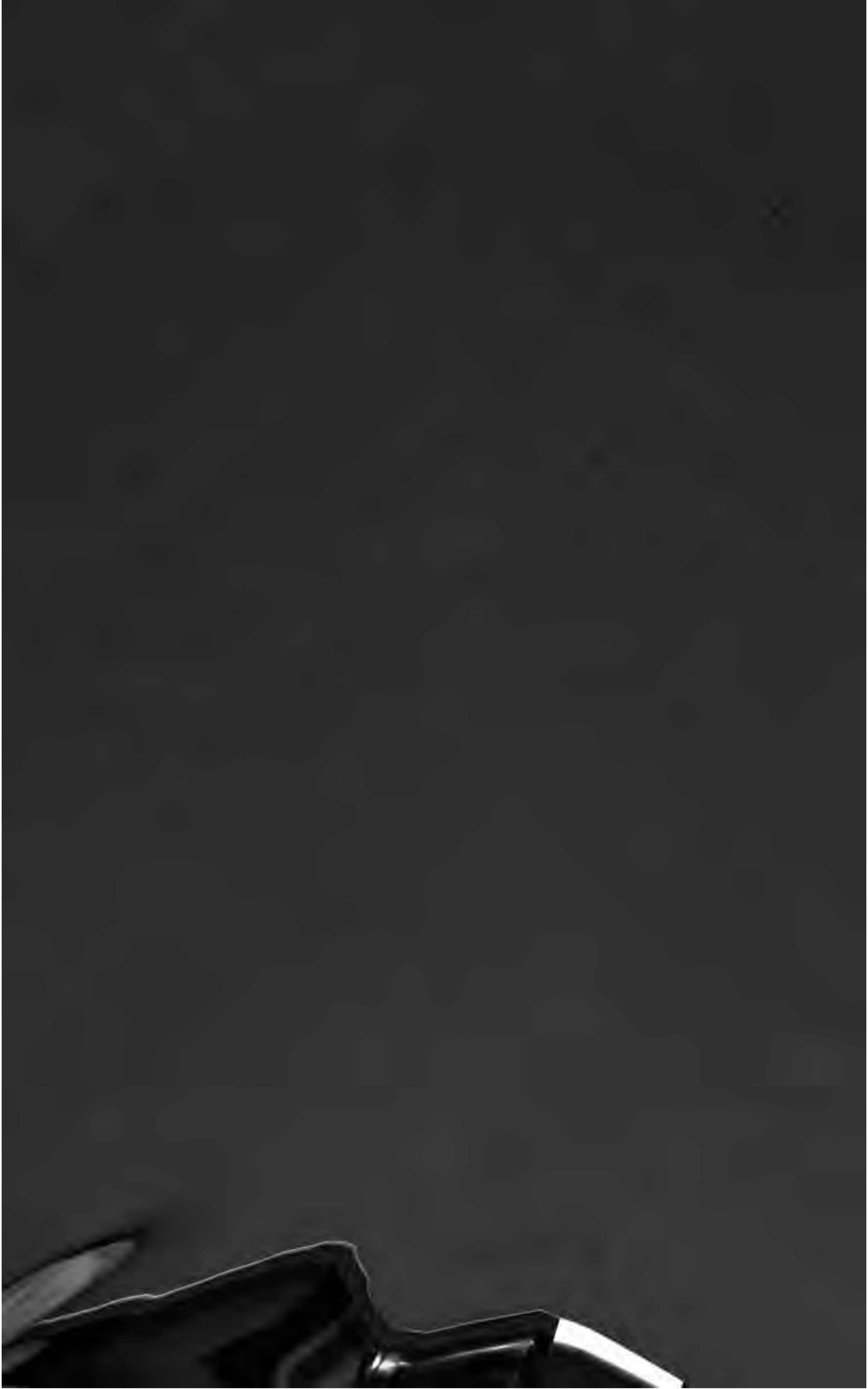

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City of Cambridge.

THE

FOURTEENTH ANNUAL REPORT

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL,

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS,

FOR THE YEAR 1878.

BOSTON:
FRANKLIN PRESS: RAND, AVERY, & COMPANY.
1879.

☆ CAMBRIDGE PUB. LBRY

REPORT

OF

THE CAMBRIDGE WATER-BOARD.

To the Honorable City Council of the City of Cambridge:—

In obedience to the requirement of the city ordinance, the Cambridge Water-Board herewith presents its Fourteenth Annual Report.

Total Cost of the Works.

Cost of the Water-works Nov. 30, 1877, as per last year's report	$1,672,592	29
Expended for construction during the year ending Nov. 30, 1878	12,752	55
Total expenditure	$1,685,344	84
Add difference between discount and expenses allowed, and premium received in negotiating the water-loan from the first, as per statement of W. E. Gates, expert	6,827	10
Making total cost of works Nov. 30, 1878 .	$1,692,171	94

Net Cost of Water-Works.

Amount of total cost as above stated . . .	$1,692,171	94
Less amount of water-loan paid from the water-debt sinking-fund to Nov. 30, 1878 . . .	186,400	00
Amount carried forward	$1,505,771	94

Amount brought forward	$1,505,771 94
This is the amount of unpaid water-debt, Nov. 30, 1878[1]	
Deduct from this the value of the water-debt sinking-fund as shown by the Trustees' account to Nov. 30, 1878	296,289 71
Showing net cost of the works Nov. 30, 1878 .	$1,209,482 23

Statement showing in brief the transactions on account of the Water-works for the year ending Nov. 30, 1878:—

Received.

Appropriation for construction account . .		$16,000 00
From water rates . . .	$158,438 15	
Less water rates refunded . .	994 24	
		$157,443 91
Shutting off and letting on water . . .		1,316 59
Rent of house		140 00
From supply account, and the sale of old material,		3,784 89
Balance showing loss in 1878		738 46
		$179,423 85

Expended.

For construction account	$12,752 55
Maintenance account	25,229 06
Supply account	1,754 79
Interest on water-debt	90,960 00
Paid into the sinking-fund	45,480 00
Unexpended appropriation	3,247 45
	$179,423 85

Comparative Receipts.

Water rates for the year ending Nov. 30, 1878,	$157,443 91
" " " " " " " " 1877,	154,843 59
Showing gain in the year 1878	$2,600 32

There are due from the city water rates which were not approved in time to include in this year's account, to the amount of $7,164.65.

---

[1] There is a discrepancy between the water-bonds outstanding and the unpaid cost of the Water-works, amounting to $22,728.06, to which we call your attention, and which we will explain in another part of our report.

Water-Bond Account.

Whole amount of water-bonds issued		$1,714,900 00
Less amount paid from sinking-fund		186,200 00
Bonds outstanding per Auditor's books		$1,528,700 00
Money in the City Treasurer's hands taken from the sinking-fund to pay matured bonds not yet presented for payment		200 00
Leaving amount of unpaid water-bonds		$1,528,500 00
Total expenditures on Water-works as per previous account herein presented		$1,685,344 84
Add the difference between the discount, brokerage, and tax paid, and the premium received in selling the bonds, as being a proper charge against the Water-works, say amount of discount allowed	$22,699 63	
Amount of brokerage and tax paid	1,381 57	
	$24,081 20	
Less premiums received	17,254 10	
		6,827 10
Making the total cost of the works		$1,692,171 94
Less amount paid from sinking-fund		186,400 00
Showing the unpaid cost of Water-works		$1,505,771 94
And we have as a result as follows: —		
Amount of unpaid water-bonds		$1,528,500 00
Amount of unpaid cost of Water-works		1,505,771 94
Balance		$22,728 06
Showing that the unpaid water-bonds exceed the unpaid cost of the Water-works in the sum as shown of		22,728 06

It is plain that this amount does not in any way belong in the water-debt, and, further, that we have been charged the interest on this sum from time to time while it has been accumulating.

This has been brought about by the unexpended balances due from the sale of water-bonds, having lapsed into the city treasury at the end of the year, while the extension of the Water-works account got no credit in the next year for this unexpended amount.

We would recommend that you cause this account to be made up correctly, and the proper steps taken to make the outstanding water-bonds, and the unpaid cost of the Water-works, agree; and that the accounts be so kept in the future, that a similar discrepancy will not appear.

In former years there have been charged to the Water-works account, several large amounts, the connection between which and the extension of the Water-works it was difficult for all to see. But, whatever differences of opinion there may have been in regard to these special items referred to, it seems to us there can be none in regard to the impropriety of charging to the Water-works any portion of the current expenses of the city; and this seems to be the case in regard to these balances, which were the proceeds of the sale of water-bonds not used for the account of the Water-works, but merged in the general funds of the city, as hereinbefore explained.

RAINFALL AS GIVEN BY THE CAMBRIDGE OBSERVATORY.

	Rainfall.			Below High-water Mark.		
	1876.	1877.	1878.	1876.	1877.	1878.
				Ft. In.	Ft. In.	Ft. In.
1877.						
December	1.04	5.09	0.84	6 1¾	4 7	2 2½
1878.						
January	1.82	3.87	5.84	5 6	4 6	2
February	4.74	0.89	6.59	5 5½	4 2½	1 8
March	6.53	7.46	4.17	5 1¾	2	9
April	4.65	3.66	5.15	4 1½	0 8½	8
May	3.07	3.58	0.87	3 8¾	0 11¾	9
June	1.92	2.26	2.68	4 0¾	1 9	1 6
July	6.06	2.66	4.82	4 11½	2 8½	2 3½
August	1.38	4.58	6.21	5 4¾	3 6½	2 3¾
September	3.77	0.51	2.24	5 8¾	4 3¾	2 7½
October	1.82	6.77	5.06	6 5½	4 6½	3 1
November	6.78	7.60	6.52	5 1¾	3 11	3
Total	43.60	48.93	50.99	Av. 5 1¾	3 1¾	1 10¾

It will be seen by this table, that we had 1.06 inches more rain in 1878 than in 1877, and that we had 11 inches more water in the pond at the close of the year. The greatest variation of water in the pond during the year was 2 feet 4 inches, from the highest to the lowest point.

By reference to the superintendent's report, we find that we pumped in 1877, 960,582,300 gallons, a daily average of 2,631,732 gallons; while in 1878 we pumped 823,874,400 gallons, a daily average of 2,257,190 gallons; showing a gain this year over last year of 136,707,900 gallons less water pumped, a daily average of 374,542 gallons. This difference can be accounted for by various reasons, prominent among them being the excellent condition of our works in regard to leakage and waste. A corresponding saving has been made in the coal consumed during the year, a saving of 222,200 pounds of coal being shown over last year.

Purity of Our Water.

The vegetable growth which troubled us so much last year, and of which we gave extended account in our last report, was very much less this year; showing that for some reason the unusual growth of last year was an abnormal development, and that we need not expect, except at long intervals, such growth as was then manifested.

The water from Fresh Pond has been analyzed many times during the past season, with similar results as have followed former examinations. We send you herewith a letter, and tabular statement, from Professor William R. Nichols, showing the results of seventeen different examinations made by him during the year.

Letter from Professor Nichols of the Mass. Institute of Technology, accompanying the Table of different Analyses in 1878.

BOSTON, Dec. 14, 1878.

GEORGE P. CARTER, ESQ.,
President Cambridge Water Board, Cambridge, Mass.

My dear Sir, — I enclose herewith a table containing the results of some of the examinations of Fresh-Pond water, which have been made in my laboratory during the present year.

These samples were taken two feet below the surface at one or the other of two points several hundred feet apart, at the mouth of the bay from which the conduit issues. I have made other examinations of water taken at different depths at the same time; but, as they form part of an investigation which I am making with reference to some disputed points in the history of pond waters, I do not care to publish the results until I have accumulated more data than I have at present, lest they should give rise to some premature generalizations. If these enclosed results are of any service to you, I should be glad to have you make use of them.

Yours very respectfully,
WM. RIPLEY NICHOLS.

ANALYSES OF FRESH-POND WATER BY PROFESSOR WILLIAM RIPLEY NICHOLS DURING THE SEASON OF 1878.

[Results expressed in parts in 100,000.]

No.	Date.	Locality.	Unfiltered Water.		Total solid Residue dried at 212° F.	Chlorine.	Temperature in Degrees Fahrenheit.
			Ammonia.	"Albuminoid Ammonia."			
1	May 4	S.W. buoy	.0021	.0176	12.4	1.41	62°
4	" 14	" "	.0027	.0149	13.1	1.23	58
7	June 4	" "	.0945	.0155	16.1	1.41	66
10	" 12	N.E. "	.0027	.0155	13.3	1.31	63
13	" 19	S.W. "	.0027	.0129	13.7	1.38	69
16	" 25	N.E. "	.0035	.0285	15.6	1.47	72
19	July 2	S.W. "	.0039	.0251	14.7	1.47	82
22	" 9	N.E. "	.0035	.0184	13.8	1.38	79
25	" 16	S.W. "	.0029	.0203	13.2	1.30	78
28	" 23	N.E. "	.0021	.0173	13.2	1.40	75
31	August 6	N.E. "	.0037	.0197	11.7	1.44	75
34	" 13	S.W. "	.0045	.0216	12.0	1.37	75
37	" 20	N.E. "	.0045	.0196	11.0	1.36	75
40	" 27	S.W. "	.0024	.0202	11.7	1.31	72
43	October 21	N.E. "	.0181	.0166	13.3	1.46	..
46	November 7	S.W. "	.0309	.0173	11.5	1.22	49
49	December 7	N.E. "	.0296	.0234	12.6	1.30	40

Several analyses of Fresh-Pond water have been made during the year by Professor Sharples; and with his table he sends the results in connection with those of Professor Nichols at the same or about the same time, and also gives what he thinks is the best solution of the fact that our water during the late fall and winter months is not in as good condition as other parts of the year. We submit herewith his communication for your more full information, and for future reference.

DEC. 16, 1878.

TO THE CAMBRIDGE WATER-BOARD: —

The analyses of Professor Nichols and myself, made at various times, of the water of Fresh Pond, would seem to indicate, that, while the annual change in the water is but slight, it nevertheless does go through a regular series of changes.

These changes are shown by the ammonia, and more markedly by the free than by the albuminoid. We have now available about thirty determinations of the free and albuminoid ammonia in the water of the pond, besides a few exceptional ones by Professor Nichols made of the water taken from the bottom of the pond last December.

Those made by Professor Nichols may be found in his special report to this Board, and in the last Annual Report of the State Board of Health.

The majority of my analyses are also reported in the same report. I have tabulated all these analyses in Table I. This seems to show that, while the albuminoid ammonia is almost constant, varying only from about .0150 to .0230, with the exception of two or three isolated cases, the free ammonia, on the contrary, is subject to much greater variations. It remains about constant from May to October; then it suddenly rises from about .0050 to .0144, attaining its maximum at about the end of the month, when it reaches .0419: from that time until March and April it seems to gradually sink. Now, while the determinations are far too few to speak with certainty, as they should extend over years of time with constant observations of the temperature and rainfall, and also microscopic observations of the life in the pond, yet I think they are sufficiently numerous to show that there is a law governing the changes, which may be briefly stated thus: —

The amount of free ammonia in the water is small so long as plant-life is vigorous and healthy; but so soon as this is checked by the frost in the fall this suddenly rises, from the fact that the plants commence to decay as soon as they are killed; and the amount of ammonia is also, no doubt, increased by the leaves that blow or fall into the pond, and there decay. This ammonia gradually escapes until by about May, or sooner, according to the state of weather, and according to the fact of the ice covering the pond or not, it has arrived at about its normal state. The round is again repeated the next year.

In order to establish this law in regard to the water, and also to ascertain the facts in regard to the remaining water-supply of the city, analyses should be made at least once every two weeks, extending over a space of not less than two years; and these analyses should not only cover the waters of Fresh Pond, but should also include determinations of Little Pond, Spy Pond, Wellington Brook, and the conduit.

With the facts that we now possess, it is very evident that no single isolated determination of any of these waters is very satisfactory as showing whether it is remaining constant in quality, or whether it is deteriorating.

Respectfully,

S. P. Sharples.

TABLE OF ANALYSES.

		Ammonia.					Ammonia.		
		Free.	Albuminoid.	Total.			Free.	Albuminoid.	Total.
Feb. 22, 1875	S.	.0170	.0155	.0325	Aug. 6, 1878	N.	.0037	.0197	.0234
March 13, 1876	S.	.0048	.0086	.0134	" 13, 1878	N.	.0045	.0216	.0261
May 4, 1878	N.	.0021	.0176	.0197	" 20, 1878	N.	.0045	.0195	.0240
" 14, 1878	N.	.0027	.0149	.0176	" 27, 1878	N.	.0024	.0202	.0226
June 2, 1875	S.	.0010	.0050	.0060	Sept. 4, 1877	N.	.0061	.0197	.0258
" 4, 1878	N.	.0045	.0155	.0200	" 4, 1877	N.	.0051	.0248	.0299
" 12, 1878	N.	.0027	.0155	.0182	Oct. 1, 1877	S.	.0050	.0148	.0198
" 16, 1875	S.	.0010	.0050	.0060	" 18, 1877	N.	.0144	.0234	.0378
" 19, 1878	N.	.0027	.0129	.0156	" 21, 1878	N.	.0181	.0166	.0347
" 25, 1878	N.	.0035	.0285	.0320	Nov. 14, 1877	N.	.0419	.0179	.0598
July 2, 1878	N.	.0039	.0251	.0290	" 7, 1878	N.	.0309	.0173	.0482
" 9, 1878	N.	.0035	.0184	.0219	" 14, 1878	S.	.0224	.0224	.0448
" 16, 1878	N.	.0029	.0208	.0232	Dec. 7, 1878	N.	.0296	.0234	.0530
" 23, 1878	N.	.0021	.0173	.0194					

General Remarks.

There has been but very little done this year in the extension of the Water-works; and what has been done is so fully set forth in the Superintendent's Report, which we present herewith, that we need say no more on this topic than to refer you to his report for full details of the work done.

The almost annual agitation of the question as to the purity of our water-supply, and what is necessary to preserve its purity, has again come up this year; this time forced upon public attention by the erection of a large slaughter-house by Niles Brothers, within a short distance of Fresh Pond, and very near our conduit connecting Fresh Pond with our other sources of water-supply.

As soon as it was ascertained that there was an intention to build this slaughtering establishment, all steps at our command were adopted to prevent it. A committee consisting of the Mayor, the City Solicitor, and the President of this Board, was appointed with full power, with instructions to do every thing that could be done to prevent the evil results that must inevitably follow the prosecution of this business as was contemplated.

It was found that the parties building, had not first procured the consent of the Selectmen of Belmont according to the law in regard to erecting slaughter-houses; and application was made to the Supreme Court for an injunction to forbid any further work on the building. At the same time the Board passed a vote, requesting the Selectmen of Belmont to grant us a hearing before giving their permission to have the slaughter-house erected, which we considered would be of great damage to the city of Cambridge, and, so far as we could see, of little or no benefit to the town of Belmont. A hearing was granted; and the City Solicitor, with Judge Hoar, who had been retained as counsel, and the President of this Board, with other members, appeared before the Board of Selectmen of Belmont, consisting of Messrs. Josiah S. Kendall, Henry Frost, jun., and Converse F. Livermore, and presented the case, showing by expert witnesses, the danger to our water-supply that would result from such a business carried on where it was intended; saying and doing all that could be said or done to induce them to withhold their consent to the erecting of the building. But it was all of no avail, and a permit was given to have the building completed and used as a slaughter-house. We cannot look upon this act on the part of Belmont, except as most unneighborly in an adjoining town, and granted by those who represented the town in utter disregard of the Golden Rule. We think the time will come, not far distant, when the better portion of the citizens of Belmont will heartily regret and condemn this action of her representatives.

After a permit was granted by the Selectmen of Belmont, no legal ground for asking an injunction from the Supreme Court was left. Our next hope of relief was from the State Board of Health. It was found they could do nothing until the business was begun. The building was completed; and slaughtering of hogs commenced the latter part of November, at the rate of several hundred daily.

As soon as it could be done, a petition was presented by the Mayor to the State Board of Health, asking them to "order Niles Brothers to cease and desist from slaughtering and rendering;" and we are waiting with interest the result of this petition, a hearing having been granted thereon.

There is reason to believe, that while we may be fully satisfied that the business ought not to be carried on at a place so near our works, and cannot be long continued without contaminating our water-supply, yet that there is no remedy until it can be shown that our water has actually become impregnated with the vile refuse from the slaughter-house. This, of course, cannot be done until the ground has become saturated with corruption; and then it is almost if not entirely beyond remedy: as if vaccination could not be enforced until the person was broken out with small-pox, or sanitary measures could not be legally enforced until the epidemic had already broken out in the community. If this is so, it would seem that it only needed a statement of our case to show how entirely inadequate are our laws in regard to the powers granted to the State Board of Health to protect sources of water-supply.

It only remains for us to go to the Legislature for relief from this imminent danger, and urge upon our law-makers such enlargement of the powers of the Board of Health, that when a plain case is made out, showing that any business must, in the nature of things, result in the pollution of the sources of any water-supply, it can be prohibited at once, without waiting until the damage is done. To an earnest effort in this direction we invite your co-operation.

In view of the importance of this matter, we would recommend that some measures be taken to advise our citizens of our danger in this respect, that all may join, and use all the influence they have to induce the Legislature to grant the needed relief. The danger does not come from this one slaughter-house alone, bad as it is, but from the fact, that, if one party can make that a good point to carry on the business, then why not another, and another, until that whole neighborhood becomes one great abattoir? There are few places in the towns and cities about Boston that desire this business carried on within their borders; and the permission of Belmont to the building of this slaughter-house is an invitation to all others who would like to engage in this business. With this business will grow up a settlement of houses in the immediate neighborhood which will be also quite objectionable. Already several of these little houses are built with no drainage except into the soil around them. We have thus tried to present this matter to you fully, that you may take whatever steps are necessary before it shall be too late. We think prompt and decided action now is the part of prudence, and will prove to be economy in the end.

In our last annual report we called attention to some bad sewerage matter that was running into the pond on the south-westerly side; and we recommended the building of a sewer from the Cushing-street district in Belmont, around the borders of the pond, to carry this very bad drainage into Alewife Brook. But as yet nothing has been done about it, and we are obliged to report that the nuisance remains still unabated. One reason why nothing has been done about it is, that it was believed the State Board of Health now has the power to call on parties whose drainage pollutes the sources of any water-supply, to take care of the sewerage themselves, in which case this nuisance should be removed by the town of Belmont: a demand has been made on Belmont to stop the drainage from Cushing Street from running into the pond.

Another reason for the delay is, that already three sewers empty from Cambridge into Alewife Brook, where there is not sufficient current to carry away the drainage put into it. Complaints have now been made by adjoining cities and towns, that a nuisance now exists on account of the drainage emptied into Alewife Brook. It is certainly true that the brook is in a filthy condition, and that, too, within a short distance of Fresh Pond; and no doubt can exist but that something should be done at once to relieve the pond from this danger of pollution.

In our former reports we have repeatedly called your attention to the importance of protecting our water-supply from pollution. New dangers are constantly arising, as our recent experience shows, which will require care, and command attention. It seems plain to us that in some way Fresh Pond and its borders should be controlled by the city of Cambridge.

In view of the public feeling existing at the present time as to the future of our water-supply, it was our intention to treat this matter in our report somewhat in detail; but as a committee has been appointed by the City Council to take the whole matter into consideration, with power to employ experts, and report the results of their labors, we refrain from entering further into the subject at present, awaiting the report of said committee.

We hope that the efforts of the committee may result in having *something done* to remedy existing evils, and, as far as possible, provide against others in the future.

It may not be amiss here to say that nearly every available source of water-supply within fifty miles of Boston has been examined by the ablest experts, both engineers and chemists, as to the quantity and quality of the waters. This information can be had by simply procuring and reading the published reports on the subject: many of these reports are now in possession of this Board or its members.

During the year settlements have been made with certain parties for land-damages and right of way for our conduit from Fresh Pond to our other sources of water-supply, and on this account the following sums have been paid: —

Jacob Hittinger	$993 58
Warren S. Frost	560 17
William Black	163 86
Richardson & Bacon	252 27
Henry Y. Hill	811 69
Warren S. Frost	241 69
Legal expenses	600 00
	$3,623 26

The other cases are now in the hands of the City Solicitor for settlement.

We are happy to report the efficiency and faithfulness of our officers and other employees. Our Superintendent has been thorough in looking after his work, and especially in looking for and stopping leaks and waste, working both night and day in this direction. His labors have been rewarded in the very favorable record our pumping shows. The office in charge of our Registrar and his assistants was never in so good condition as now: any information wanted in this department is promptly and correctly furnished. Our engineer shows a year's work of our pumping-engines with but very slight. repairs, and a good record on pumping-expenses. In short, we do not think our Water-works were ever so well officered by those employed by this Board, or the works generally in so good condition, as at the present time.

The new system of accounts adopted in this and other departments of the city is now in full working order; and while it is not unfrequently a little annoying to some of our customers, in its details with which they must comply, yet it is arranged with so many checks and counter-checks against errors and dishonesty, that we fail to see how the system can be improved in this respect.

We would again call attention to the importance of improving the piece of land between the pond and Lakeview Avenue, in order to comply with the conditions upon which the Tudor heirs agreed to give it to the city. When the material was first taken out of the pond, its nature was such that nothing would grow on it: it has now been exposed nearly two years, and it should be improved by mixing what is necessary with it to make good soil, and then set out trees and shrubs, and lay it down to grass, in compliance with the conditions of the gift.

We wish to record our obligations to the City Engineer and City Solicitor, for the cheerful and valuable service they have rendered us during the past year, each doing all in his power to assist us when called upon.

So far as we now see, no large amount will be required the coming year for extension account, except for what may be found expedient or necessary to preserve the purity of our water-supply. We have already seen that it is not Fresh

Pond alone that demands attention; but that any plan, to be at all complete, must include the protection of Little Pond and also the conduit connecting with Fresh Pond.

In due time estimates will be made as to the amounts required for the ensuing year for extension, maintenance, and supply accounts, for which we shall ask the usual appropriations.

We submit herewith the Reports of the Registrar and Superintendent to us, which we adopt as part of our Report, and to which we would refer you for the details of work done, and the present condition of things in their charge.

GEO. P. CARTER,
C. W. KINGSLEY,
SAM'L L. MONTAGUE,
H. L. EUSTIS,
JOHN W. LEIGHTON,
J. WARREN MERRILL,
GEO. S. SAUNDERS,
} *Cambridge Water-Board.*

CAMBRIDGE, Dec. 16, 1878.

APPENDIX.

LAST year we sent a communication to your honorable body in reference to the matter of preserving the purity of our water-supply. This was accompanied by a report on the subject made to this Board by the City Engineer. By some means it was not published with our report last year as it should have been. It seems to us that it is a document that ought to be preserved; and we append it to this report, with the request that it may be published as a part of the history of our Water-works in the progress of their development.

TO THE HONORABLE CITY COUNCIL OF THE CITY OF CAMBRIDGE: —

Gentlemen, — Last year a joint special committee of the City Council was appointed "to confer with the Water-Board as to the sources of pollution to our water-supply, and the means of preventing the same."

From the report of that committee we make the following extract: —

"Fresh Pond is really our reservoir or settling-basin, and should be protected from the constantly increasing drainage on the shores. While no perceptible evil has yet come from this source, yet it is wisdom to provide for the future, and see that the pond is properly protected. To do this, we must control the borders of the pond, and, if possible, the pond itself. And we would therefore recommend that *immediate* action be taken, under the authority that we already possess, to control that portion of the borders connected with the hotel and picnic grounds, and on the south-westerly side, near Cushing Street; and that, after a careful survey has been made and a system of sewerage adopted for this whole territory, then whatever land is shown by the survey to be necessary for the full protection of the pond, and for ultimately building a sewer entirely around it, be taken for that purpose."

In the last report of this Board made to your honorable body, the following things were recommended for early attention at our hands: —

"*First*, Secure a strip of land around Fresh Pond, of sufficient width to enable us to preserve the purity of the water in the pond; and we think that the land needed for this purpose can be properly ascertained only by a careful topographical survey of the land around the pond.

"*Second*, Provide a basin which shall receive nearly all the surface-drainage now coming into the pond, and from which the water can find its way into the pond only after being filtered through a bed of gravel. This, we think, can be done at a very moderate cost, after securing the land."

It will be seen hereby that your committee and the Water-Board were agreed that *something should be done to "preserve the purity of the water."* As stated above, the Water-Board thought that a temporary basin could be made to receive and filter the surface-drainage from the Cushing-street district; but in the spring, by advice of the City Engineer, the idea of a filter-dam was abandoned. He was then requested to examine and report what was necessary to be done in order properly to "preserve the purity of the water;" and he has made a report to this Board, a copy of which we submit herewith for your consideration. It will be seen that a very large expense will have to be incurred to carry out the plans needed properly to protect the pond; as the first thing to be done towards carrying out any plan is to secure the needed land around the pond, and as the present authority "to take five rods wide" around the pond is not practicable, for the reasons that the State has never defined the border of the pond, and we should not know where to measure from if we wanted to take five rods wide. Another reason is, that in some places, on account of the lay of the land, more than five rods is needed to do what is necessary.

The Water-Board wishes to do its whole duty in this matter, so as to meet the just demands of our citizens in this most important matter, and would therefore recommend as follows: —

First, That the mayor be requested to take proper action to give notice that the city will apply for authority to take whatever land around Fresh Pond may be found necessary to protect the purity of the water in the pond.

Second, That your honorable body shall provide the means, and do whatever is necessary, to protect the pond from surface and filthy drainage, as set forth in the City Engineer's report herewith submitted.

To the Committee on Reservoirs and Pumping, of the Cambridge Water-Board: —

Gentlemen, —Early in the season my attention was called to that portion of the borders of Fresh Pond, at the outlet of a small pond situated in what may perhaps be better known as the Strawberry-Hill district, from which some very objectionable drainage, at certain seasons of the year, finds its way into Fresh Pond. I had observed this point for about a year previous; but had never seen any water or sewage passing through the culvert under Cushing Street, and had been assured, in fact, that no open culvert existed, the same having been filled up, and that no water could pass through. Statements to the contrary having been made, it was closely watched in the spring of the present year. In March the water had so accumulated that the pond was filled, and overflowed through the culvert, which proved to be an open one; and continued for several weeks to discharge into a bog north of Cushing Street, and thence into Fresh Pond. The matter was of a very filthy and disgusting character.

The plan of building filter-dams across the two ends of the bog was proposed, and plans prepared at once; but, on further consideration, it became evident that they would not accomplish the object desired. The plan was abandoned; and I was requested to examine, with a view of drainage to some point away from the pond. This proved a rather difficult thing to accomplish, except at great expense, situated as it is, in a low, steep valley of about fifty-three acres, surrounded by high, steep hills, and far away from any suitable point of discharge. It soon became evident that a general system for the whole future drainage of the surroundings of our water-supply should be included and considered; and, in this connection, it may be well to describe what the principal sources of pollution are, and how located with reference to drainage.

First, Strawberry Hill, already mentioned, a drainage area of about fifty-three acres, with steep slopes, and largely covered with houses and many filthy appurtenances, together with two small ponds, the overflow of which is, as before described, into Fresh Pond. Then the Fresh Pond Hotel, the arrangements of which are good; and, if proper care be taken of them, and the vaults not allowed to overflow, need cause no alarm. The house-drainage is delivered on a cultivated field, at some little distance from the pond. The whole should be carefully watched, and proper care insisted on.

The next is Alewife Brook, the natural outlet from Fresh Pond, as well as Little and Spy Ponds. There are at present emptying into this brook three large main sewers, as follows: Concord Avenue, intended as the outlet of the proposed marginal sewer around Fresh Pond, with a drainage area of 298.21 acres; Spruce Street, with a drainage area of 382.93 acres; and North Avenue, with 182.64 acres: the North-avenue and Spruce-street sewers draining, each for a portion of their areas, quite closely populated districts; Concord Avenue entering it at a point about four hundred feet distant from the pond, the drainage backing into the gate-house on the border of the pond, and kept out from it by a single gate of plank. When the water in the pond is below the level of the brook, as it has been for a considerable portion of the time for several years, any accident happening to the gate causing a leakage, or its removal, would cause a discharge of sewage into it which it might be impossible to remove. With a very small outlay, this might be made secure from danger. Just beyond North Avenue, the brook also receives the drainage of the tanneries of William Muller and Ferdinand Fischer, both large establishments; all the drainage of these is poured into the brook, and may be seen at the tide-gates on Broadway in considerable quantities, and has been removed at this point for a number of months, as often as once a week. Many complaints are made by the residents of its vicinity; and it is believed that the recent order of the Fish Commissioners, for the construction of the fishway, is but the entering-wedge for the entire removal of the sewage.

It has been my impression, from my first connection with the city, that, if the waters of Spy and Little Ponds and Wellington Brook are to be used, the drainage from the brook should be removed at the *earliest possible* day. There are times in each year when the meadows are covered, and the whole becomes one vast pond. It hardly seems possible that so much filth as there is emptied into this brook, will not, in times of flood, mix with and contaminate the ponds. On the line of Wellington Brook is the Richardson Piggery, situated quite near it, and with a connecting ditch within a few feet, receiving the washings from it. Above this point, and in Belmont, to near Waverly, there are many places where the house-drainage is discharged directly into the brook, many of the houses being fitted with water-closets and other modern improvements; while, in other cases, privies are placed directly on the banks, with the matter passing into the water. When last visited, a few weeks since, they were in a most filthy condition. Many of these places might perhaps be removed or improved by direct negotiation with the parties, and having the work done under the direction of the superintendent, thus avoiding litigation; a process which is slow, and usually not satisfactory to either party.

With regard to the importance of this matter, Dr. Cresson, in his report on an examination of the water from the Schuylkill River, says, in conclusion, "I will briefly enumerate what I deem to be proper steps to be taken to restore and maintain the purity of our water-supply. First, the *diversion* of all sewage now flowing into the pool of Fairmount Dam, below Falls Bridge, into some other channel. Second, the *diversion* of all sewage containing fæcal and animal matter now flowing into the river below Flat Rock Dam, into some other channel." "Fifth, the cultivation of fish and suitable plant-life in and upon the water of the river."

Dr. Frankland, Professor of Chemistry in the Royal Institution and Royal School of Mines, says, "In the first place, when water is once contaminated with sewage, there is no process to which it is afterward subjected, which will effectually remove all that sewage contamination from the water. Filtration will not do it, in certain cases, at all events. I have found that the excrement of cholera-patients cannot be filtered out of the water; that after a degree of filtration which, I believe, is never obtained by the water companies, and rarely obtained, perhaps, by the passage over soils in irrigation, this water still remains opalescent from the rice-water evacuations with which it is mixed. I believe that the noxious part in sewage is that which is held in mechanical suspension, not in solution. I would not say it is impossible to remove it, but no system of filtration will secure its removal.

"There are only two processes by which it can be effectually removed: the one is by boiling for a long time, and the other is by distillation; and therefore it is that I say that, inasmuch as these two processes are impracticable on a large scale, in my opinion, water that has once been contaminated by sewage ought not afterward to be used for domestic purposes. And inasmuch as it is generally believed that the noxious matters of sewage exist there in the form of minute germs, which are probably smaller than blood-globules, I do not believe that even filtration through a stratum of chalk could be relied upon to free the water perfectly from such germs."

Again, Mr. Simon, F. R. S., the medical officer of Her Majesty's Privy Council, says, "Water into which sewage has been discharged is, in relation to the matter now under consideration, an experiment on the health of the population, and I do not think that that experiment ought to be tried. I think the drinking of such water is dangerous. It is not practicable to define the exact line at which danger begins in a particular case. Everybody knows that water with certain obvious pollutions by sewage is fatal to health; and I do not know where to draw the line, in practice, between such cases and those which are, practically speaking, unimportant."

In the Fifth Report of the Massachusetts State Board of Health we find, "Too much stress cannot be laid upon the importance of *preventing* the discharge of such refuse and sewage, in a restricted sense, into any stream or pond used, or likely to be used, as a source of water-supply." Again: "The second opinion is, that sewage, diluted to a very considerable extent, becomes innocuous. This opinion, which involves questions belonging to the physician rather than to chemistry, is very likely to be carried too far."

"While with a small amount of sewage the chances are as favorable as possible for the action of the atmospheric influences, and the chances of taking up any undecomposed particle of material, capable of propagating disease, are rendered proportionately small to the great dilution, it is to be borne in mind that the action of such matter on the system is not cumulative; a minute quantity may do much harm, because it is now generally believed that it may hold the specific thing which propagates specific diseases." I need not add more. The whole matter is ably discussed in a paper prepared by Julius W. Adams, on the "Pollution of Rivers, as applicable to the future Water-Supply of the City of Philadelphia, 1875."

Having enumerated the principal sources of contamination of the waters of our supply, and the danger that may result therefrom, the question naturally arises: What is the remedy? It seems very clear that the answer is, that they must be prevented from entering the waters.

The long-talked-of marginal sewer around Fresh Pond would secure the water of that pond; and a sewer parallel with, and at a suitable distance from, Alewife Brook, would intercept all the sewers now emptying into it.

The natural outlet for this sewer would be in Mystic River, at a point near its junction with Alewife Brook. As a portion of this sewer would be in Somerville, it is possible that that city would join in its construction; there being, I understand, no present drainage for that section.

The route would be as follows, together with size and approximate cost:—

	Size.	Length.	Cost.
Mystic River to North Avenue,	6′10″	5,410	$66,603 00
North Avenue to Spruce Street,	6′ 3″	2,500	24,040 80
Spruce Street to Concord Avenue,	5′ 3″	3,400	33,000 00
Watertown Br. R.R. to Lakeview Avenue,	3′ 0″	2,030	4,269 35
" " to Cushing Street,	2′ 6″	2,900	5,076 23
		16,240	$132,989 18

There should also be a branch to Fresh Pond Hotel, not included in the above estimate. The portion from the Watertown Branch Railroad to Cushing Street would be a portion of the marginal sewer around Fresh Pond.

Another route, with outlet in Charles River, and almost entirely within the limits of Cambridge, is as follows: —

	Size.	Length.	Cost.
North Avenue to Spruce Street,	4′ 2″	2,500	$22,904 00
Spruce Street to Concord Avenue,	5′10″	3,400	33,539 30
Concord Avenue to Mount Auburn Street,	6′ 8″	4,960	64,141 36
Outlet sewer in Mount Auburn Street,	6′ 9″	3,500	59,259 29
Branch to Strawberry Hill around margin of pond,	2′ 6″	2,900	5,076 23
			$184,920 18

Or by another route: —

To Strawberry Hill,	2′ 9″	3,580	$12,623 50
Making the total cost,			$192,476 45

For Wellington Brook the sewage should be brought down in a pipe, or the brook abandoned to sewage, and the water brought in a pipe. For the sewage, a small pipe would answer, if it were used only for the present and likely sources of pollution, and not for the main for town drainage. If this water is to be used, I urge the importance of the sources of pollution before named receiving immediate attention. But to return to Strawberry Hill. It is important that before the fall and spring rains occur, something should be done at this point; and I would suggest, that, if suitable arrangements can be made with the owners, the water be pumped over the intervening hill through a pipe to Bird's Pond. An eight-inch Blake or Knowles pump, with three or four inch discharge-pipe, would, I think, remove all the accumulation to a point where it could not overflow into Fresh Pond. A dam would be required at the northerly end of the small pond at its present outlet, and a small building for the engine. This would need to be run only a portion of the time, the water being allowed to reach a certain height, and then pumped down. The banks are so steep that a considerable increase in depth would but slightly increase the area. The great amount of vegetation and the numerous pond-lilies growing in Bird's Pond would, I think, effectually prevent any nuisance being caused therefrom. If this plan should meet with favor from your Committee, I would suggest that a further and more careful examination be made, with a view to carrying it out at an early day. This is proposed as a temporary measure, until the system of drainage can be carried out.

Respectfully submitted,
W. S. BARBOUR, *City Engineer.*

CAMBRIDGE, Sept. 28, 1877.

REPORT

OF

THE WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, Dec. 16, 1878.

TO THE WATER BOARD:—

The undersigned herewith presents his Third Annual Report, showing the "receipts, expenditures, and abatements" for the year ending Nov. 30, 1878, together with a statement of the number of water-takers, fixtures, &c., and other matters in his department, as required by ordinance.

Receipts.

Water rates	$132,447 82	
Meter rates	20,084 20	
		$152,532 02
Water rates for previous years	$1,308 94	
Meter rates for previous years	239 69	
City rates for 1877	4,357 50	
		5,906 13
		$158,438 15
Off and on water, seals and fines	$1,316 59	
Rent of house at pipe-yard	140 00	
		1,456 59
		$159,894 74
Less water rates refunded		994 24
		$158,900 50
Supplies and repairs	$2,829 38	
Old material sold	955 51	
		$3,784 89
		$162,685 39

Received by Registrar, and paid to City Treasurer		$8,730 09
Received by City Treasurer, and reported to Registrar		153,955 30
		$162,685 39

Expenditures.[1]

Construction account		$12,752 55
Supply account		1,754 79
Maintenance account, viz.: —		
Care and repairs	$14,028 32	
Pumping-service	5,920 15	
Office expenses	5,280 59	
		25,229 06
Total		$39,736 40

Abatements.

Abatements have been made during the year to the amount of	$11,619 13
Water rates have been refunded, for houses shut off or fixtures sealed, to the amount of	994 24

By the new system adopted the present year, reports are made monthly to the City Auditor of amount of bills placed in the Treasurer's hands for collection during the preceding month. Report being made of annual bills for all houses where water is on, at or just previous to July 1, necessitates abatement of all charges upon fixtures sealed, or houses shut off (whether per order of owners or for non-payment), before the books can be balanced. New charges are then made when the water is again let on. This has caused the above large amount of abatements.

Water has been shut off for non-payment of rates, or per order of owners on account of vacancy, and seals have been applied by request of owners or occupants, as follows: —

Houses shut off in 1878	523
Houses let on in 1878	353

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[1] See Auditor's Report for detailed statement of expenditures.

Houses let on (shut off in previous years)	92
Seal-locks applied to fixtures in 1878	1,114
Seal-locks removed from fixtures in 1878	385
Seal-locks removed (put on in previous years). . . .	248

Water rates unpaid Nov. 30	$826 52
Meter rates unpaid Nov. 30	173 63
City rates unpaid Nov. 30	7,164 65
Supplies and repairs Nov. 30	893 95
Total	$9,058 75
Also charges for supplies and repairs prior to May 1, 1876	6,335 21

Statement of the yearly revenue received from water rates since the purchase of the works by the city.

From April 28, 1865, to Dec. 1, 1865 . . .		$32,367 19
Dec. 1, 1865 " 1866 . . .		40,073 27
" 1866 " 1867 . . .		52,733 62
" 1867 " 1868 . . .		63,747 42
" 1868 " 1869 . . .		76,149 30
" 1869 " 1870 . . .		92,606 95
" 1870 " 1871 . . .		111,782 65
" 1871 " 1872 . . .		127,201 30
" 1872 " 1873 . . .		146,117 32
" 1873 " 1874 . . .		153,634 27
" 1874 " 1875 . . .		138,880 37
" 1875 " 1876 . . .		179,166 76
" 1876 " 1877	$158,078 11	
Less refunds . . .	3,234 52	
		154,843 59
From Dec. 1, 1877, to Dec. 1, 1878 .	$158,438 15	
Less refunds . . .	994 24	
		157,443 91

COMPARATIVE STATEMENT.

	1877.		1878.	
CONSTRUCTION ACCOUNT.				
Received		$15,881 98		$12,752 55
Expended		15,881 98		12,752 55
SUPPLY ACCOUNT.				
Received, —				
Supplies and repairs	$6,204 86		$2,829 38	
Old material sold	626 54		955 51	
		$6,831 40		3,784 89
Expended		4,107 04		1,754 79
Excess of receipts		$2,724 36		$2,030 10
MAINTENANCE ACCOUNT.				
Received, —				
Water rates, less refunds	$154,843 59		$157,443 91	
Off and on water, seals, and fines	1,360 30		1,316 59	
Rent and insurance premium	151 25		140 00	
		$156,355 14		$158,900 50
Expended, —				
Care and repairs	$9,520 56		$14,028 32	
Pumping service	7,564 49		5,920 15	
Office expenses	5,527 39		5,280 59	
Interest on water debt	90,000 00		90,960 00	
Paid to Sinking-Fund Commissioners	45,000 00		45,480 00	
		157,612 44		161,669 06
Excess of expenditures		$1,257 30		$2,768 56

1877.	Supply Account, — Excess of Receipts	$2,724 36
	Maintenance Account, — Excess of Expenditures	1,257 30
	Balance	$1,467 06
	Excess of Total Receipts over Total Expenditures.	
1878.	Maintenance Account, — Excess of Expenditures	$2,768 56
	Supply Account, — Excess of Receipts	2,030 10
	Balance	$738 46
	Excess of Total Expenditures over Total Receipts.	

The usual annual examination of premises has been made, and the office-list of fixtures changed in accordance therewith.

102 new supplies have been laid during the year, 9 of which have not yet been paid for, or water let on.

18 meters have been placed in use in various locations during the year, and 10 have been removed: 126 meters are now in use.

Besides the manufactories, &c., supplied by meter, water is now supplied to

9,838 Families.
732 Stables.
395 Shops, stores, and offices, by the following fixtures, viz.:
11,821 Faucets.
3,183 Wash-basins.
1,696 Wash-tubs.
1,641 Bath-tubs.
3,911 Pan-closets.
554 Slop-closets.
20 Hopper-closets.
74 Urinals.
65 Yard-hydrants.
6 Fountains.
1,084 Hose.
4 Tumbler-washers.

The above is exclusive of the school-houses, engine-houses, police-stations, and other city buildings, using the additional number of

76 Faucets.
30 Wash-basins.
4 Bath-tubs.
5 Urinals.
31 Pan-closets.
12 Door-closets.
5 School-closets.
4 School-urinals.
49 School-sinks.
6 Stables.
6 Hose.
1 Steam-engine.
582 Fire-hydrants.
14 Fire-reservoirs.
14 Drinking-fountains.
5 Garden-hydrants.

Respectfully submitted,

J. WARREN COTTON, *Registrar.*

REPORT

OF THE

SUPERINTENDENT OF THE WATER-WORKS.

CAMBRIDGE, Dec. 4, 1878.

TO THE PRESIDENT AND MEMBERS OF THE CAMBRIDGE WATER-BOARD:

Gentlemen, — The Annual Report of your Superintendent, upon the condition of the works and the operations of the past year, is herein presented.

Little Pond, Wellington Brook, and Conduit.

The pipe connection of Little Pond with Spy Pond is in good order, but has not been used this year. Additional facility of flowage from Spy Pond into Alewife Brook has been obtained by digging a ditch four feet wide along the east side of the box-culvert formerly and still in use for the same purpose. Nothing else has been done upon the borders of either of the ponds, and the water of both has presented a much better appearance the past year than during that which preceded it.

Inspections have been made of Wellington Brook and its branches during the season, but nothing has been found impairing the purity of its water beyond what existed at date of last report. Water has been drawn from this source for a few days only, in February last, when occurred a very heavy rainfall.

Such examinations as can be made while in use show the filter-basin, and the conduit thence to Fresh Pond, in good order and working condition, which is true also of the gates and gate-houses. No repairs have been made, except that the Wellington Brook flume has been cleaned out, and the wood-work, above water, has received a coating of asphalt. Water has been delivered into Fresh Pond, from the filter-basin at Little Pond, since July 26. At that date Fresh-Pond gauge read 14.23, Little-Pond gauge 15.20, and about the same relative heights have been maintained since.

Fresh Pond.

The borders of the pond have remained in substantially the same condition as at date of last report. Large amounts of weeds have been removed during the summer; and repairs have been required upon the stones facing the banks of the easterly side, many of them having been displaced by storms. Alewife Brook gate-house and the screen-house have been painted and put in good condition.

Pumping-Works.

The conduit, pump-wells, and gates appear in perfect condition, no interior inspection having been deemed necessary. The grounds about the pump-house have been somewhat improved by additional filling in places that had settled, and they now present a neat and attractive appearance. The boiler-room has been whitewashed, and a vane erected on the pump-house, with an indicator inside the building. Mr. E. C. Brooks, the engineer, reports the engines and boilers in perfect condition, and that the repairs have been of a trivial nature.

One leak has occurred, and been repaired, upon the pumping mains.

Reservoirs.

The interior of the stand-pipe has been whitewashed and painted, provision has been made for ventilation, and both the interior and exterior are in thorough repair. A chronograph has been set up, which automatically notes the fluctuations in height of the water surface of the reservoirs. Its nightly records are of particular value in promptly detecting the existence of any unusual draught, from leakage or otherwise.

By contract with W. C. Poland & Son, the north-east wall of the large reservoir has been rebuilt in a complete and satisfactory manner. The renewal of the fence abutting the Reed estate also became necessary. Whilst the wall was rebuilding, the reservoirs remained drawn down materially, until the completion of the work. Upon refilling them, leakage through the west banks was apparent, making its appearance under the coping of the retaining-wall for nearly the whole length on Reservoir Street; and large quantities of water were found to be flowing under the supply-pipe to the large reservoir, finding its way to the sewer in Reservoir Street, attended with injury to the banks near the stand-pipe. Repairs were made under direction of the City Engineer, which consisted of cut-off walls of concrete about three feet thick at each end of the partition between reservoirs; removing portions of reservoir paving on both sides of partition coping-stones, and filling all vacant space beneath with grout; rebuilding the overflow well and the southerly gate-chamber, repairing banks, calking and pointing joints in reservoir, paving and coping stones. Slight leakage appeared upon refilling the reservoirs, through the joints of the coping-stones, particularly where they rest on the paving-stones of the interior; and a grout wall behind the coping, to a depth somewhat below the top of the interior paving, may become necessary to resist the action of the frost. There is undeniable evidence of slight changes in the retaining-wall north of the stand-pipe, but no repairs have been made the past season. A blind drain has been built obliquely across Reservoir Street, from near the north-west corner of the wall foundations to the sewer, with a manhole at the junction.

Distribution-Pipes.

Very little has been done the past season. Connection has been made of the North-avenue pipes at Porter's Station bridge; new eight-inch and ten-inch pipes have been laid in Bridge and Prison-Point Streets, to obtain abundant fire-supply; and four-inch and six-inch pipes have been substituted for a smaller size, in Essex Street. About three-quarters of a mile is the total of pipe laid. Owing to alterations of grade, the pipes in Allston Street, near Fort Washington, and in Sparks Street, near Concord Avenue, have been lowered. Several gates have been set, for more perfect control, in the Cowperthwaite-street and the Cambridge-street districts; any general raising of pipes in these localities, however desirable, being postponed for the present.

Supply-Pipes.

One hundred and two new service-pipes have been laid, increasing the total of last year to 7,058. Only the best of materials, with good workmanship, are allowed. Most leakage occurs from the supply-pipes. One hundred and eighty-six leaks have been stopped the past year, only thirty-five of which were on pipes of four inches and upwards. During this year systematic labor at night, by disconnecting small sections, and making thorough examinations and tests for discovering the condition of the pipes, has been attended with generally satisfactory results. I am convinced that the leakage from pipes is now comparatively small; that constant vigilance, with nightly tests, is necessary to maintain this condition; and that much more water is wasted from fixtures than is now leaking from the pipes. Instances have been detected of reckless and long-continued abuse in this matter, and many undetected cases probably exist.

Hydrants, Meters, Fountains, and Stand-Pipes.

Eight new post-hydrants have been set in new locations, and two have replaced old flush-hydrants. All but one are of the "Pattee and Perkins" pattern. The total number is 581, of which 235 are post and 346 flush hydrants. Two new garden-hydrants have been set, making the present total 103.

Eighteen new meters have been set, and 10 disconnected, the total number being now 126. Other changes have been made with advantage, usually by substituting small-sized meters for those needlessly large in capacity.

Seventeen drinking-fountains are in use, located as described in annexed table. Those recently set have improved drainage facilities, and all fixtures are self-closing. Thirty-six stand-pipes, for street-watering, have remained in use the past year, but one change of location being made. Fountains and stand-pipes are in good order.

Pipe-Yard.

The yard on Auburn Street has been enlarged, a new stable has been built, the wagons put in thorough repair, the dwelling-house painted outside and inside, its walls papered, and some grading done, until the whole is in complete order.

The following tables show the monthly amount and daily average of water pumped, the Fresh-Pond record of water height, the locations of meters, fountains, and stand-pipes, the details of main and supply extensions, and the account of stock on hand.

All which is respectfully submitted,

HIRAM NEVONS, *Superintendent.*

APPENDIX.

ENGINE RECORD.

The Amounts of Water pumped being computed from Engine Revolutions.

In the Month of—	Running Time.		Pounds of Coal used.	Monthly Totals.	Daily Average.
	Hours.	Minutes.		Gals. pumped.	Gals. pumped.
December, 1877 . .	289	35	133,100	64,366,500	2,076,339
January, 1878 . .	323	50	138,700	73,082,100	2,357,487
February, " . .	267	45	118,000	61,502,100	2,196,503
March, " . .	281	35	122,300	62,796,300	2,025,690
April, " . .	265	25	114,400	59,008,200	1,966,940
May, " . .	310	30	122,000	71,400,900	2,303,255
June, " . .	310	..	122,600	73,396,200	2,446,540
July, " . .	372	35	152,400	89,212,200	2,877,813
August, " . .	322	30	135,900	71,565,300	2,308,558
September, " . .	308	5	125,000	69,424,800	2,314,160
October, " . .	308	55	127,700	69,793,800	2,251,413
November, " . .	263	45	116,600	58,326,000	1,944,200
Totals . . .	3,624	30	1,528,700	823,874,400	
Daily average for year	9	56	4,188	2,257,190	

FRESH-POND RECORD.

	Feet.
Average height of water-surface during December, 1877	14.65
" " " " January, 1878	14.86
" " " " February, "	15.18
" " " " March, "	16.08
" " " " April, "	16.16
" " " " May, "	16.09
" " " " June, "	15.43
" " " " July, "	14.55
" " " " August, "	14.54
" " " " September, "	14.22
" " " " October, "	13.78
" " " " November, "	13.84
Average of preceding heights	14.95
Highest water observed (high water) is	16.85

LIST OF METERS IN USE NOV. 30, 1878.

	Locality.	Size.	Description.
		Inch.	
American Net and Twine Co.	Third St.	1½	Worthington.
Atkins, Henry	North Ave.	⅝	Harris.
Brown & Nichols	Brighton St.	1	Worthington.
Boston Car-Wheel Co.	Hampshire St.	¾	"
Boston & Albany R. R.	Putnam Ave.	1½	"
Boston & Lowell R. R. (repair-shop)	Prison Point	2	"
" " " (old roundhouse)	" "	2	"
" " " (new roundhouse)	" "	2	"
" " " (paint shop)	" "	1	"
" " " (stand-pipe for feeding locomotives)	" "	6	Union Rotary.
Boynton Packing Co.	Winsor St.	1½	Worthington.
Boston Chemical Works	Third St.	¾	"
Bullock, O. S.	Broadway	1	"
Boston Rolling Mills	Portland St.	2	"
Boston Stamping Co.	Third St.	2	"
City of Cambridge (Ward 1 Building)	Brattle Sq.	2	"
" " (Almshouse)	Tannery St.	2	"
" " (Ward 4 Building)	Green St.	2	B. & F.
Cambridge Gas-Light Co.	Third St.	2	Worthington.
Cofran, S. M.	Vassal Lane	2	"
Clark, B. P. & Co.	Main St.	1½	"
Harvard College (Boylston Hall)	. . . . . .	1	"
" " (in yard)	. . . . . .	1½	"
" " (Thayer Hall)	. . . . . .	1½	"
" " (Holworthy Hall)	. . . . . .	¾	"
" " (Stoughton Hall)	. . . . . .	1	Boston Machine Co.
" " (Dining Association, Memorial Hall)	. . . . . .	2	Worthington.
" " (Boat-house)	Flagg St.	⅝	B. & F.
" " (Holyoke House)	. . . . . .	2	Worthington.
" " (Botanical Garden)	. . . . . .	1	"
Coolidge, Jos. G.	Coolidge Ave.	1	"
City of Cambridge (Cambridge Cemetery)	. . . . . .	4	"
Carr Brothers	Lopez St.	1	"
Corning & Co.	Belmont St.	⅝	"
Draper, F. & Co.	Otis St.	¾	"
Dover Stamping Co.	Pleasant St.	1	"
Davis, Curtis, & Co.	Broadway	1½	"
Davis, Jas. C., & Son	"	1	"
Denham, George A., & Co.	Thorndike St.	1	"
Dailey, William	Cambridge St.	1	"
Eagle Rubber Co.	Potter St.	2	"
French, C. A.	Farwell Place	1	"
Felton Hall	Cambridge St.	1½	"
Fitzpatrick, Alfred	Sands St.	¾	"
Geldowsky, F.	Otis St.	1	"
Griffin & Dolan	Decatur St.	¾	"
Gould, Patch, & Co.	Cambridge St.	2	"
Goepper Brothers	Gore St.	¾	"
Houghton, H. O., & Co.	Blackstone St.	1	"
" " " (fountain)	" "	¾	"
Hancock & Greely	Broadway	1½	"
Hews, A. H., & Co.	Crescent Ave.	1	"

LIST OF METERS IN USE NOV. 30, 1878 — *Continued.*

	Locality.	Size.	Description.
		Inch.	
Hale, Teele, & Bisbee	Davis St.	1	Worthington.
Hixon, Edward	Harvard St.	⅝	"
Hovey's Nursery	Cambridge St.	1	"
Jones, C. L., & Co.	Pearl St.	⅝	"
Jaynes & Co.	Pacific St.	¾	"
Kennedy, F. A.	Green St.	1	U. R. P.
Kendall & Roberts	Main St.	⅝	W.
Harvard Laundry	Douglass St.	⅝	B. & F.
Little, Brown, & Co.	Blackstone St.	1	Worthington.
Low, J. W.	Reed St.	1½	"
Lewis, F. H.	Broadway	1	"
Lowe, E. D.	Portland St.	⅝	"
Lincoln, Chamberlin, & Co.	Distillhouse St.	2	"
Mount Auburn Corporation (greenhouse)	Brattle St.	1	"
" " " (cemetery)		1½	"
Mason & Hamlin Organ Co. (east wing)	Broadway	1	"
Middlesex Bleachery	Sacramento St.	¾	"
Middlesex County (House of Correction)	Thorndike St.	2	"
" " (Court-house)	" "	2–⅝	B. & F.
" " (Registry of Deeds)	Otis St.	¾	Worthington.
Moering, Mrs. A. L.	Main St.	1½	"
Murdock, Robert	Hews St.	⅝	B. & F.
New England Glass Co.	North St.	2	Worthington.
" " Brick Co.	Raymond St.	1½	"
Orne, C. P.	Main St.	1	"
Page, George G., & Co.	Hampshire St.	2	"
Ela, Richard	Broadway	1	"
Pike, Jas., & Co.	Church St.	1	"
" " "	Farwell Place	¾	"
Parry, C. E.	Raymond St.	⅝	"
Revere Sugar Refinery	Water St.	3	"
" " "	" "	3	U. R. P.
Reardon, John, & Son	Pearl St.	⅝	Worthington.
" " "	Allston St.	4	"
Reversible Collar Company	Arrow St.	1	"
Rogers, G. M.	Washington St.	3	"
Rhoades, Silas, & Co.	State St.	2	"
Shaw & Applin	Bridge St.	1½	"
Sortwell & Co.	Distillhouse St.	2	"
Squire, John P., & Co.	Gore St.	2–2	"
" " "	" "	1	"
Sands, J. L.	Walden St.	⅝	"
Standard Ammonia Co.	Potter St.	⅝	"
St. Mary's School	Harvard St.	⅝	"
" Catholic Church	Norfolk St.	2	"
Stiles, J. C.	Cambridge St.	2	"
Shorey, George L.	Soden St.	1½	"
Scorgie, Wight, & Co.	Mt. Auburn St.	⅝	"
Thayer, Henry, & Co.	Broadway	2	"
Tower, Sylvester	"	1	"
Tug "Henry Chapel"	First St.	2	"
Thorndike, Edward	Main St.	⅝	B. & F.
Union Railway Co.	Cambridge St.	1½	Worthington.
" " "	Dunster St.	⅝	"
" " "	" "	⅝	"

LIST OF METERS IN USE NOV. 30, 1878 — *Concluded.*

	Locality.	Size.	Description.
		Inch.	
Union Railway Co.	Dunster St.	1	Worthington.
" " "	" "	¾	"
" " "	" "	1½	"
" " "	Mt. Auburn St.	2	"
" " "	Main St.	1	"
" " "	North Ave.	2	"
" " "	Baldwin St.	1	"
" " "	" "	1	"
" " "	River St.	1	"
Union Glass Co.	Webster Ave.	1	"
" " "	" "	1	"
Uhrig, Jos.	Main St.	1½	"
Wyatt, H. M.	Dublin St.	¾	"
Walworth Manufacturing Co.	Main St.	1½	"
Wilson, John, & Son	Holyoke St.	1	"
Woodbury & Co.	Otis	2	B. & F.
Welch, Bigelow, & Co.	Brattle St.	¾	"
Woods, George, & Co.	Main St.	2	Worthington.
Woodbury & Co.	Green St.	1	"

List of Drinking-Fountains, Nov. 30, 1878.

Bridge, junction of Cambridge Street.
Broadway, south-west corner of Norfolk Street.
Brattle Square, east side of Brewer's Block.
Brattle Street, junction of Fresh-Pond Lane.
Cambridge Street, south corner of Fifth Street.
Central Square, west side.
Central Square, east side.
Fort Washington.
Hampshire Street, junction of Broadway.
Inman Square, east side.
Main, junction of Front Street.
Main, junction of Mount Auburn Street.
North Avenue, south-west corner of Walden Street.
North Avenue, north side, west of Cameron Street.
Putnam Avenue, south-west corner of Pearl Street.
Third Street, west side, north of Main Street.
Harvard Square, at the flag-staff.

List of Stand-pipes (for Street-Watering), Nov. 30, 1878.

Brattle Street, near University Press.
Brattle Street, corner of Sparks Street.
Brattle Street, near Fayerweather Street.
Brattle Street, near Fresh-Pond Lane.
Bridge Street, junction of Cambridge Street.
Broadway, near Third Street.
Broadway, corner Sixth Street.
Broadway, corner Winsor Street.
Broadway, junction Hampshire Street.
Brookline Street, corner Putnam Avenue.
Cambridge Street, near Warren Street.
Cambridge Street, near Winsor Street.
Cambridge Street, at Inman Square.
Columbia Street, near Austin Street.
Concord Avenue, at junction of Garden Street.
Dana Street, at corner of Chatham Street.
Dublin Street, near Fitchburg Railroad.
Fifth Street, near Thorndike Street.
Gore Street, west of Third Street.
Green Street, near Western Avenue.
Harvard Street, corner of Prescott Street.
Inman Street, near Broadway.
Kirkland Street, near Quincy Street.
Main Street, near Portland Street.
Main Street, near Hancock Street.
Magazine Street, opposite Warland Street.
Mount Auburn Street, near Athens Street.
North Avenue, near Common.
North Avenue, corner of Sacramento Street.
North Avenue, near Forest Street.
North Avenue, near Beech Street.
North Avenue, near Spruce Street.
North Avenue, corner of Norris Street.
Third Street, near Rogers Street.
Thorndike Street, near Third Street.
Western Avenue, near Howard Street.

NEW MAIN PIPE LAID FOR EXTENSIONS AND RENEWALS, FROM DEC. 1, 1877, TO NOV. 30, 1878, INCLUSIVE, WITH THE NUMBER OF NEW GATES AND FIRE-HYDRANTS USED.

LOCATION.	IRON PIPE.		GATES.		FIRE HYDRANTS.	
	Size.	Length.	No.	Size.	No.	Size.
	Inch.	Feet.		Inch.		Inch.
Sparks Street, west of Concord Avenue . . .	8	3	..	..	1	5
" " " " " . . .	6	7	..	..	..	..
Jefferson and Warren Streets	4	3	1	4	..	..
Potter and Warren Streets	4	3	1	4	..	..
" " Bedford Streets	4	3	1	4	..	..
River Street, extension of blow-off	6	8	..	..	..	..
Prison-Point Street	8	650	2	8	1	5
" "	6	12	..	..	..	..
Bridge Street	12	10	1	12	2	5
" "	6	20	1	10	..	..
" "	8	678	1	8	..	..
" "	10	673	3	6	..	..
Lambert Avenue, west from North Avenue . .	6	250	1	6	1	5
North Avenue, at Porter's Bridge*	10	72	1	10	..	..
Bristol Street, west from Webster Avenue . .	4	180	1	4	..	..
Waverley Street, at Fort Washington . . .	4	10	1	4	..	..
Allston Street, at Magazine Street	4	175	..	..	1	5
" and Waverley Streets	4	278	1	4	..	..
Pearl Street, corner of Allston Street . . .	6	10	..	..	1	5
Hastings Square	4	111	..	..	..	..
Blackstone Street, at H. O. Houghton's (renewal) .	4 3	30 4	1 1	4 3	1	..
Mill Street, near Holyoke Street	6	8	..	..	1	5
De Wolf and Cowperthwaite Streets	4	2	1	4	.	..
Charles River and Mill Streets	..	..	2	4	..	..
Flagg Street, corner of Banks Street . . .	4	2	1	4	.	..
Kirkland and Sumner Streets	4	3	1	4	..	..
" " Irving Streets	4	3	1	4	..	..
Avon and Shepard Streets	4	3	1	4	..	.
Essex Street (renewal)	6	466	additional. 1	4	1	5
" "	4	624	1	6	..	..
Follen Street (renewal)	4	125	..	..	..	..

PIPE LOWERED ON ACCOUNT OF CHANGE OF GRADE OF STREET.

	IRON PIPE.			IRON PIPE.	
	Size.	Length.		Size.	Length.
	Inch.	Feet.		Inch.	Feet.
Sparks Street	6	218	Allston Street	4	220

REPORT

OF THE

TRUSTEES OF THE SINKING-FUND OF THE CAMBRIDGE WATER-WORKS.

The Trustees of the Sinking-Fund of the Cambridge Water-Works respectfully submit the following Report:—

Amount of the fund, June 30, 1877		$232,734 13
Received from the City of Cambridge under a provision of the ordinance passed Oct. 4, 1876, the same being three per cent on amount of outstanding water-loan bonds		45,480 00
Received interest on investments		20,571 40
		$298,785 53
Paid water-loan bond due May 1, 1875, but not presented for payment until March 8, 1878	$100 00	
Paid into the city treasury for the payment when presented of two outstanding bonds (of $100 each) due May 1, 1875	200 00	
Paid accrued interest on bonds purchased for investment during the year	1,151 82	
Paid premium on bonds purchased for investment during the year	659 50	
Premium account of previous years now charged off	4,718 75	
		6,830 07
Amount of the fund Nov. 30, 1878, all securities at par		$291,955 46

As all our city accounts are by ordinance made up to Nov. 30 of each year, the Trustees have thought it best to make this fund up to the same date: the above statement therefore comprises the transactions of eighteen months.

The amount of the fund as given above is accounted for by the following list of investments comprising the same, viz.: —

Cambridge water-loan bonds at par	$207,900	00
“ low-land loan “ “	3,000	00
City of Providence “ “	47,000	00
“ “ Fall River “ “	2,000	00
“ “ Charlestown (Boston) bonds at par .	1,000	00
U.S. government four per cent “ “ .	31,000	00
Cash on hand	55	46
Amount of the fund as per Auditor's ledger .	$291,955	46
Adding *accrued interest* on the above, viz. . .	4,334	25
the VALUE of the fund Nov. 30, 1878, is . . .	$296,289	71

Respectfully submitted,

SAM'L L. MONTAGUE,
GEO. S. SAUNDERS,
WM. W. DALLINGER,
Trustees of the Sinking-Fund of the Cambridge Water-Works.

CAMBRIDGE WATER-BOARD, 1879.

GEORGE P. CARTER . . . . . *President.*

Members of Board.

THE MAYOR, PRESIDENT OF COMMON COUNCIL,	*ex officiis.*	
HENRY L. EUSTIS,	*term expires* . . .	1883.
CHESTER W. KINGSLEY,	" " . . .	1882.
J. WARREN MERRILL,	" " . . .	1881.
GEORGE P. CARTER,	" " . . .	1879.
JOHN H. LEIGHTON,	" " . . .	1880.

JUSTIN A. JACOBS, *Clerk.*

J. WARREN COTTON, *Water Registrar.*
HIRAM NEVONS, *Superintendent of Works.*

Trustees of Sinking-Fund of Water Loan.

THE MAYOR, CITY TREASURER, PRESIDENT OF COMMON COUNCIL,	*ex officiis.*

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THE

FIFTEENTH ANNUAL REPORT

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL,

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS.

FOR THE YEAR 1879.

LITERIS ANTIQUIS NOVIS INSTITUTIS DECORA
CIVICO REGIMINE DONATA A.D. 1846
CANTABRIGIA
CONDITA A.D. 1630

CAMBRIDGE:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1880.

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☆ CAMBRIDGE PUB. LBRY

REPORT

OF THE

CAMBRIDGE WATER BOARD.

To the Honorable City Council of the City of Cambridge: —

In compliance with the provision of the city ordinance, the Cambridge Water Board herewith presents its Fifteenth Annual Report.

Total Cost of the Works.

Cost of the Water Works Nov. 30, 1878, as per last year's report	$1,692,171.94
Expended on construction during the year ending November 30, 1879	4,424.56
Total expenditure	$1,696,596.50

Net Cost of the Water Works.

Total cost as above stated	$1,696,596.50
Less amount of water loan paid from the water-debt sinking-fund up to Nov. 30, 1879	186,400.00
Leaving the amount of unpaid water debt	$1,510,196.50
Deduct from this the value of the water-debt sinking-fund, as shown by the trustees' account of Nov. 30, 1879	353,468.02
Showing the net cost of the works, Nov. 30, 1879	$1,156,728.48

Statement showing in brief the transactions on account of the Water Works for the year ending Nov. 30, 1879.

Received.

Appropriation for construction account		$8,000.00
From water rates	$166,248.86	
Less water rates refunded	1,566.96	
		164,681.90
Shutting off and letting on water		982.65
Rent of house		144.00
From supply account		2,883.17
From bonds of A. F. Fifield		1,250.00
		$177,941.72

Expended.

For construction account	$4,424.56
For maintenance account	25,993.08
For supply account	1,534.20
Interest on water debt	91,585.00
Paid into the sinking-fund	45,855.00
Unexpended appropriation	3,575.44
Balance, showing gain in 1879	4,974.44
	$177,941.72

Comparative Receipts.

Water rates for the year ending Nov. 30, 1879	$164,681.90
Water rates for the year ending Nov. 30, 1878	157,443.91
Showing gain in the year 1879	$7,237.99

Water Bond Account.

Whole amount of water bonds issued	$1,714,900.00
Less amount paid from sinking-fund	186,400.00
Leaving amount of water bonds unpaid	$1,528,500.00
Total cost of works as herein shown	$1,696,596.50
Less amount paid from sinking-fund	186,400.00
Showing the unpaid cost of Water Works	$1,510,196.50
Amount of unpaid water bonds	$1,528,500.00
Amount of unpaid cost of Water Works	1,510,196.50
Showing that the unpaid water bonds exceed the unpaid cost of the Water Works	$18,303.50

It is plain that this amount of $18,303.50 does not in any way belong to the Water-Bond debt, and further, that the Water Works have been charged the interest on this sum from time to time while it has been accumulating, as was explained in last year's report. This has been brought about by the unexpended balances from the sale of water bonds having lapsed into the city treasury at the end of the year, while the Water-Works account got no credit in the next year for this unexpended amount.

We would again recommend that you cause this account to be made up correctly, and the proper steps taken to make the unpaid water bonds and the unpaid cost of the Water Works agree, and that the accounts be so kept in the future that a similar discrepancy will not again appear.

Comparative Rainfall as given by the Cambridge Observatory, and Height of Water in the Pond from our own Record.

MONTHS.	RAINFALL.			BELOW HIGH-WATER MARK.		
	1877.	1878.	1879.	1877.	1878.	1879.
	Inches.	Inches.	Inches.	Feet.	Feet.	Feet.
[1] December	5.09	0.84	4.39	4.57	2.20	2.15
January	3.87	5.84	2.20	4.49	2.00	2.25
February	0.89	6.59	3.48	4.21	1.66	2.92
March	7.46	4.17	4.02	2.00	0.75	2.72
April	3.66	5.15	5.65	0.66	0.68	1.62
May	3.58	0.87	1.28	0.96	0.75	1.50
June	2.26	2.68	4.59	1.75	1.42	1.79
July	2.66	4.82	2.64	2.68	2.29	2.27
August	4.58	6.21	5.79	3.50	2.27	2.79
September	0.51	2.24	1.71	4.30	2.68	3.11
October	6.77	5.06	0.76	4.50	3.08	3.97
November	7.60	6.52	3.18	3.91	3.00	4.58
Total	48.93	50.99	39.64	Av. 3.13	1.89	2.64

[1] This is in each case the December of the previous year.

It will be seen that we had 11.35 inches less of rainfall in 1879 than in 1878, — a falling off of about 22 per cent; and that we have 1.58 inches less water in the pond than at the close of last year. The difference in the height of water in the pond at this time and a year ago is principally accounted for by the increased consumption, and by the difference in the rain-fall. The greatest difference in the height of water in the pond during the year, as shown is 3.08 feet from the highest to the lowest point reached.

We find, by the engineer's report to the superintendent, that we have used this year 1,715,200 pounds of coal and pumped 887,820,900 gallons of water. This shows an increase this year over last year of 186,500 pounds of coal, and 63,946,500 gallons of water. The difference in the amount of water used is generally accounted for, in part by the revival of business and the occupation of vacant houses, but more, we think, by the increased amount used for watering the streets, and for garden hose, on account of the dry weather running through the latter part of the year. Our chronograph, which measures accurately the night consumption, and the waste and leaks, shows that our pipes are in as sound condition as they have ever been, which reflects credit on our superintendent, who has been untiring in his efforts to reduce the amount of waste and leaks to the lowest possible point.

It is a source of pleasure to notice at how small expense the two Worthington pumps that we have in use have been kept in repair; they are each of 5,000,000 gallons daily capacity, and by reference to the engineer's report it will be seen that the cost of repairs for the year amounted to only $64.24; confirming us in our view that, in point of economy, these are the best pumps in the market for water-works use.

Purity of Our Water.

We have had very little trouble this year with the vegetable growth in the water. It has been analyzed from time to time, as taken from different places, with about the same results as in former years. We stated in our last report what had been done to prevent the contamination of the water in Fresh Pond on account of the building of a slaughter-house in Belmont near the pond. What we then feared seems to be true, — that there is no power, even in the State Board of Health, to stop the business until we can prove that our water has actually become contaminated by the drainage or filth from the buildings. We therefore repeat our recommendation, made last year, that application be made to the Legislature for an enlargement of the powers of the Board of Health, so that when a plain case is made out, showing that any business must, in the nature of things, result in the pollution of the sources of any water supply, the same can be prohibited and stopped at once before the damage is done. As it is, we have done the best we could to guard against this danger, and the State Board of Health has done all it could, with the powers it has, to assist us. One of the Board has visited the slaughter-house every week and observed the process of the business, taking such notes as the importance of the case required for future reference, should they be needed.

We have for several successive years called your attention to some bad sewerage matter that runs into the pond near the Cushing Street district in Belmont; and we again refer to this subject, as we believe it is by far the most important connected with the purity of the water of Fresh Pond itself. We stated last year "that it was believed the State Board of Health now had power to call on parties whose drainage pollutes the sources of any water supply to take care of the sewerage themselves, and that a demand had been made upon Belmont to stop the drainage from Cushing Street running into the pond." We now understand that there are doubts in this matter about our right to call on Belmont to remove this nuisance, and furthermore there are doubts whether, without additional powers from the Legislature, we have the right to go into Belmont to build a sewer ourselves to abate this source of pollution. It will therefore appear that what is done must be done by the city of Cambridge to protect her citizens. And we do again most earnestly recommend that whatever powers are necessary be secured from the Legislature as soon as possible, and that steps be taken to have this source of pollution to our water supply at once removed. This matter has been more fully presented in our former Reports, and we need only refer you to them for any further details that you may wish in this matter.

General Remarks.

With a rapidly growing city, such as we have, the matter of the sources and quality of our present and future water supply is a subject of the greatest importance, and cannot be too carefully considered. It was no doubt in this view that more than a year ago you appointed a Commission to examine this whole matter in all its details, with the assistance of some of the best expert talent in this country. This work has been in progress during the past year, and we understand the Commission has completed its work and will report to you in print in a short time. This will make it unnecessary for us to say any thing upon this matter in the present report.

It is understood that the Commission has treated this subject with great care, with reference to our present and prospective necessities; and, coming from such high authority, the report cannot fail to command the attention of all thoughtful people to this subject, which is so intimately connected with our health and comfort.

We look forward with great interest to the views and recommendations of those who are so well able to treat this subject, and trust that their conclusions will be so satisfactory that we may be able to decide on some comprehensive plan of action for the present and future that will meet the approval of all our citizens.

We recommend that, when the report is made, it be printed with our report, with the other city documents, for our future reference and guidance.

We are pleased to report that our recommendations in reference to improving the strip of land lying between Lakeview Avenue and the pond, east of our engine house, which the Tudor Heirs agreed to give to the city upon condition of its improving the same as a common, has been well begun. It has been graded, fenced, and grassed over, and a large number of trees have been set out on it. A continued improvement is contemplated next season by setting out shrubbery, and it will thus become an attractive place to all who by pleasure or business are led to pass that way.

We would renew our former expressed appreciation of the faithfulness of our Superintendent, Registrar, and all other officers and employés of the Water Works; and we would especially acknowledge the assistance rendered to us by the City Solicitor and City Engineer, who have always been ready to assist us to the extent of their ability whenever we have called on them.

For full details of the work done the past year and the present condition of the Water Works, we would refer you to the reports of the Superintendent and Registrar, made to us, and which we herewith submit as part of our report.

GEO. P. CARTER,
C. W. KINGSLEY,
J. WARREN MERRILL,
H. L. EUSTIS,
K. S. CHAFFEE,
SAML. L. MONTAGUE,
GEORGE S. SAUNDERS,
Water Board.

REPORT

OF

THE WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, *Dec.* 18, 1879.

To the Cambridge Water Board: —

The undersigned herewith presents his Fourth Annual Report, showing the "receipts, expenditures, and abatements" for the year ending Nov. 30, 1879, together with a statement of the number of water-takers, fixtures, &c., and other matters in his department, as required by city ordinance.

Amount of bills remaining unpaid Nov. 30, 1878.

Water rates	$7,518.51	
Meter rates	646.29	
Supplies and Repairs	893.95	
		$9,058.75

Amount of bills placed in City Treasurer's hands for collection from Nov. 30, 1878 to Nov. 30, 1879.

Water rates	$144,531.55	
Meter rates	24,248.29	
Supplies and repairs	2,771.74	
Off and on water and seals	982.65	
Rent of house	144.00	
		172,678.23
Total		$181,736.98

Deduct.	Abated.	Unpaid.	
Water rates	$8,126.01	$1,763.66	
Meter rates	329.10	477.01	
Supplies and repairs	4.00	778.52	
	$8,459.11	$3,019.19	11,478.30
Balance			$170,258.68

Receipts.

Water rates	$135,486.56	
Meter rates	23,505.32	
		$158,991.88
Water rates for previous year	$432.96	
Meter rates for previous year	110.49	
City rates for previous year	6,713.53	
		7,256.98
		$166,248.86
Off and on water and seals	$982.65	
Rent of house at pipe-yard	144.00	
		1,126.65
		$167,375.51
Less water rates refunded		1,566.96
		$165,808.55
Supplies and repairs		2,883.17
		$168,691.72
From bonds of A. F. Fifield		1,250.00
		$169,941.72
Amount reported by City Treasurer as received, less amounts refunded by him		169,941.72

Expenditures.

Construction account		$4,424.56
Supply account		1,534.20
Maintenance account, viz.:		
Care and repairs	$16,402.46	
Pumping service	4,192.56	
Office expenses	5,398.06	
		25,993.08
Total		$31,951.84

Abatements.

Abatements of water rates have been made during the year to the amount of	$8,455.11
Abatements on repair account	4.00
Total	$8,459.11
Water rates have been refunded, for houses shut off or fixtures sealed, to the amount of	$1,566.96

The above amount of abatements is caused by the necessary abatement of all charges upon fixtures sealed or houses shut off (whether per order of owners or for non-payment) before the books can be balanced. New charges are then made when the water is again let on.

Water has been shut off for non-payment of rates, or per order of owners, on account of vacancy, and seals have been applied by request of owners or occupants, as follows: —

Supplies shut off in 1879	450
Supplies let on in 1879	318
New supplies let on in 1879	134
Supplies let on (shut off in previous years)	115
Seal-locks applied to fixtures in 1879	1,113
Seal-locks removed from fixtures in 1879	415
Seal-locks removed (put on in previous years)	401

Water rates unpaid Nov. 30, 1879	$441.53
City water rates unpaid Nov. 30, 1879	1,309.41
Meter rates unpaid Nov. 30, 1879	132.69
City meter rates Nov. 30, 1879	344.32
Supplies and repairs unpaid Nov. 30, 1879	778.52
Total	$3,006.47

Statement of the yearly revenue received from water rates since the purchase of the works by the city.

From	April 28,	1865,	to	Dec. 1, 1865	$32,367.19
„	Dec. 1,	1865	„	1866	40,073.27
„	„	1866	„	1867	52,733.62
„	„	1867	„	1868	63,747.42
„	„	1868	„	1869	76,149.30
„	„	1869	„	1870	92,606.95
„	„	1870	„	1871	111,782.65
„	„	1871	„	1872	127,201.30
„	„	1872	„	1873	146,117.32
„	„	1873	„	1874	153,634.27
„	„	1874	„	1875	138,880.37
„	„	1875	„	1876	179,166.76
„	„	1876	„	1877	154,843.59
„	„	1877	„	1878	157,443.91
„	„	1878	„	1879	164,681.90

COMPARATIVE STATEMENT.

	1878.		1879.	
CONSTRUCTION ACCOUNT.				
Received	....	$12,752.55		$4,424.56
Expended	....	12,752.55		4,424.56
SUPPLY ACCOUNT.				
Received	....	$3,784.89		$2,883.17
Expended	....	1,754.79		1,534.20
Excess of receipts	....	$2,030.10		$1,348.97
MAINTENANCE ACCOUNT.				
Received, —				
Water rates, less refunds	$157,443.91		$164,681.90	
Off and on water, and seals	1,316.59		982.65	
Rent	140.00		144.00	
		$158,900.50		
From bond of A. F. Fifield	....	....	1,250.00	
				$167,058.55
Expended, —				
Care and repairs	$14,028.32		$16,402.46	
Pumping service	5,920.15		4,192.56	
Office expenses	5,280.59		5,398.06	
Interest on water debt	90,960.00		91,585.00	
Paid to Sinking-Fund Commissioners	45,480.00		45,855.00	
		161,669.06		163,433.08
Excess of expenditures	....	$2,768.56		
Excess of receipts	....	....	....	$3,625.47

1878. Maintenance Account, — Excess of Expenditures	$2,768.56
Supply Account, — Excess of Receipts	2,030.10
Excess of Total Expenditures over Total Receipts	$738.46
1879. Supply Account, — Excess of Receipts	$1,348.97
Maintenance Account, — Excess of Receipts	3,625.47
Excess of Total Receipts over Total Expenditures	$4,974.44

NOTE. — To the amount unpaid, on page 294 . . . . $3,006.47
Add, water for building unpaid 12.72
Total amount unpaid, as on page 292 . . . . $3,019.19

All premises in the city where Fresh Pond water is used have been visited during the year, and the office list of fixtures changed in accordance with the report of the inspector, often showing changes that should have been reported to the Registrar by parties making them, in accordance with the provisions of the city ordinance.

125 new supplies have been laid during the year, 10 of which have not yet been paid for.

21 meters have been placed in use in various locations during the year, and 11 have been removed. 136 meters are now in use.

Besides the manufactories, &c., supplied by meter, water is now supplied to 9,968 families, 743 stables, 412 shops, stores and offices, by the following fixtures, viz.: —

12,013 faucets.
3,266 wash-basins.
1,805 wash-tubs.
1,767 bath-tubs.
3,989 pan closets.
608 slop closets.
57 urinals.
66 yard hydrants.
4 fountains.
1,003 hose.
3 tumbler-washers.

Also, —

579 fire hydrants (including 4 on private premises).
14 fire-reservoirs.
17 drinking fountains.

The above is exclusive of the school-houses, engine-houses, police-stations, and other city buildings, for which special rates are charged, except where meters are located.

By the provisions of an ordinance now awaiting final action by the City Council, the rate charged for the first faucet, used by one family only, has been reduced to $5, — the rates for faucets used "by more than one family and less than four," and "by four or more families" being also reduced to $4 and $3.50 respectively.

This large reduction of rates while many of the cities and towns are endeavoring to increase their rates (now practically higher than Cambridge), so as to place their water-works upon the same self-sustaining basis that Cambridge has been, is partially offset by restoring the allowance for fire hydrants to $30 each per annum, which had been allowed until 1875, when the allowance was reduced to $11 each.

If the receipts from increased manufacturing, and building and occupancy of houses, continues as begun this year, this reduction will largely benefit those paying less than the established commutation rate of $22, while the self-supporting principle may be sustained.

In closing my report I must not omit to express my appreciation of the ability and faithfulness of my assistant, Mr. Walter H. Harding, which I do with peculiar pleasure in view of the unusual duties devolving upon and cheerfully performed by him during a long-continued illness which, at times, in more or less degree, prevented my close attention to the duties of the office. The exactness with which all accounts balanced at the close of the year shows not only the above-mentioned faithfulness, but also the correctness of the present system of keeping the accounts.

Respectfully submitted,

J. WARREN COTTON,
Water Registrar.

REPORT

OF THE

COMMITTEE ON ACCOUNTS OF THE CAMBRIDGE WATER BOARD.

We have examined the abstract of the Books of the Water Registrar as prepared by him, and the statements of the City Treasurer and Auditor of Accounts, all of which are herewith submitted for record on the books of this Board, and we find them to agree.

It appears that the amount of bills in the hands of the Treasurer uncollected, Nov. 30, 1878, was: —

For water-rates	$7,518.51	
„ meter-rates	646.29	
„ supplies and repairs	893.95	
Total		$9,058.75

The amount of bills placed in his hands for collection by the Water Registrar during the year ending Nov. 30, 1879, was: —

For water-rates	$144,531.55	
„ meter-rates	24,248.29	
„ supplies and repairs	2,771.74	
„ turning off and on	982.65	
„ rent of house	144.00	172,678.23
Of this amount the Treasurer has collected	$170,258.68	
There have been abated	8,459.11	
And there are in his hands uncollected	3,019.19	
Total		$181,736.98

There have been refunded	$1,566.96
And there remains out a warrant uncalled for but issued by the Registrar	.92
Total	$1,567.88

In addition to the above there has been received by the Treasurer, on the bond of the former Registrar, the sum of $1,250.

J. WARREN MERRILL, } *Committee*
SAM'L L. MONTAGUE, } *on*
GEO. S. SAUNDERS, } *Accounts.*

REPORT

OF THE

SUPERINTENDENT OF THE WATER WORKS.

CAMBRIDGE, Dec. 8, 1879.

To the President and Members of the Cambridge Water Board: —

GENTLEMEN, — Your Superintendent's Annual Report upon the Works and the operations of the past year is herewith presented.

Little Pond, Wellington Brook, and Conduit.

During the past season nothing has been done on the borders of Little or Spy Ponds, nor has the pipe connection between them been used.

The usual inspection of Wellington Brook and its branches has shown nothing objectionable that was not known at the date of my last report. Water has been drawn from this source for five hours in March and three days in April, at which time occurred a heavy rainfall.

An additional gate has been set at Wellington Brook gatehouse, across the conduit, more completely to control it. Between this point and Little Pond the conduit, as well as the filter basin, appears to be in good condition. From Wellington Brook to Fresh Pond the conduit has been pumped down sufficiently for an inspection of the interior to be made throughout this length. It was found clean and in perfect repair. Water was delivered into Fresh Pond from Little Pond during one day in April.

Fresh Pond.

Except the removal of large quantities of weeds, nothing has been done on the borders of Fresh Pond. The stone facing of the banks remains in good condition. At the Alewife Brook gate-house an eighteen-inch brick and cement wall has been built across the culvert to the brook, and the culvert has been filled, for twenty feet of its length, with clay and stone, to cut off all connection between Fresh Pond and the brook.

Tudor Park.

A strip of land, containing about an acre and a quarter, lying between Fresh Pond Drive and the Pond, having been conditionally given to the city, has been improved the past season. Large quantities of loam and dressing have been spread over it, sixty-six Scotch elm and maple trees have been set out, it has been enclosed by a fence, and received the above name, and it now presents a neat and attractive appearance.

Pumping Works.

The grounds have been kept in order, the grass cut, and walks graded, and slight repairs made inside the engineer's house. A twenty-eight-ounce copper roof to the chimney has been substituted for the galvanized iron one, which was falling to pieces. The coal-shed floor has been cemented, and eight of the posts sustaining its roof have been spliced, those parts having decayed which had been covered with coal for a long period. Only a year's supply of coal should be put in at one time, as it depreciates in quality, and opportunities to dry and air the shed are necessary. The end wall of the boiler-room, adjoining the coal-shed, has received serious damage from coal-cars running against it while getting in coal, and needs repair. Accompanying this report is that of the engineer upon machinery repairs and the engine records with a schedule of stock on hand.

Reservoirs.

The outside of the stand-pipe has been painted, and a vane erected. The capping-stones of the reservoir curb having become displaced and the joints broken by the frost, repairs have been made by excavating around the outside of the capping-stones, three feet in width and from 3½ to 4½ feet in depth, and filling with concrete from one to two feet solid, and then sloping to within three inches of the top, where the width was a few inches. This work was completed the last of June, and since that time the reservoir has been filled each day to high-water mark without any indications of leaks. The reservoir is now in good repair, as also are its surroundings, and I expect that no further outlay will be required for some length of time other than for general care.

Distribution Pipes.

But very little new pipe has been laid the past season. A six-inch pipe has been substituted for a four-inch pipe in First Street, and 177 feet of six-inch pipe was raised. Connection has also been made between the ends of the lines on Sparks Street near Vassal Lane, and on Garden Street near the Botanical Garden. Five new blow-offs have been put on to dead ends. I think the time has come when the pipes should be raised in the Cambridge Street and Cowperthwaite Street districts. In these territories they are very deeply covered, in some places being under the old sewers, and leaks on supply pipes are constantly occurring. The chronograph has become invaluable for detecting leaks and determining the night consumption and waste. Very valuable records have been obtained from it during the year, especially in October and November, all of which show the distribution service to be in as good condition as appears from any prior observations.

New Supplies.

One hundred and twenty-five new supplies have been laid this season, increasing the total of last year to 7,183. Twenty-two old supplies have been renewed as they had become rusted out. Ninety-seven sidewalk shut-offs, with stand-pipes, have been put on to old supplies. Two hundred and twenty-five leaks have been stopped, forty-seven of which were on three-inch pipe and upwards.

Hydrants, Meters, Fountains, and Stand-Pipes.

Three new post-hydrants of the Boston Machine Company pattern, have been set in new locations. Five flush-hydrants have been disconnected. The total number is now 579, of which 239 are post and 340 flush hydrants. Four new garden hydrants have been set, making the present total 107. Twenty-one new meters have been placed, and eleven disconnected, making the total number 136. The number of drinking-fountains remains the same as at date of my last report. Three have had cesspools built around them, and been supplied with drainage. All are in good repair. One new stand-pipe for street-watering has been set on North Avenue opposite Tannery Street, making the total number in use thirty-seven.

Pipe Yard.

All the pipe and fittings on the wharf have been removed to the pipe yard except the twenty-inch and thirty-inch. Slight repairs have been made on the house, and all the buildings are in good repair.

The following tables show the location of meters, fountains, and stand-pipes, the details of main and supply extension, and the account of stock on hand. A diagram is also appended, showing relative consumption from 1870 to and including the present year.

All of which is respectfully submitted,

HIRAM NEVONS, *Superintendent.*

REPORT

OF THE

ENGINEER AT THE PUMPING STATION.

PUMPING STATION, CAMBRIDGE WATER WORKS,
CAMBRIDGE, Dec. 1, 1879.

Hiram Nevons, Esq., Supt. Cambridge Water Works: —

SIR, — I would report that the engines and boilers are in good condition, only the ordinary repairs having been required during the past year. The small engine which has been on hand here for the past ten years has been set up in the cellar, and an eighteen inch by ten foot engine lathe, with shafting, pulleys, hangers, &c., purchased; the whole adding much to the convenience of doing repairs. Following will be found a statement of the expenses at the pumping station, together with the engine record, pond level, and rainfall for the past year, also a list of stock and tools on hand.

E. C. BROOKS, *Engineer.*

Statement.

765$\frac{1600}{2240}$ tons Cumberland Coal at $4.85	$3,713.72
Oils, waste, packing, etc.	247.06
Salaries	3,150.00
Repairs on engines and boilers	64.24
Tools	427.94
Repairs on buildings and care of grounds	522.34
	$8,125.30

Engine Record, Pond Level, and Rainfall.

Date.	Total Running Time.		Daily Average Running Time.		Total Coal consumed.	Daily Av. Coal consumed.	Total Water pumped.	Daily Average Water pumped.	Average Height of Pond.	Rainfall.
	hrs.	min.	hrs.	min.	pounds.	pounds.	gallons.	gallons.	feet.	inches.
December, 1878	306	50	9	54	141,100	4,552	65,414,400	2,111,013	14.71	4.67
January, 1879	379	05	12	14	164,900	5,319	81,742,200	2,636,845	14.62	2.25
February, "	320	55	11	28	140,900	5,032	73,137,300	2,612,046	13.96	2.92
March, "	330	30	10	40	148,600	4,794	75,153,600	2,424,310	14.15	4.26
April, "	319	05	10	38	143,800	4,793	70,322,400	2,344,080	15.26	5.13
May, "	362	30	11	42	153,200	4,942	80,520,300	2,597,429	15.45	1.22
June, "	356	25	11	53	137,900	4,597	78,305,100	2,610,170	15.08	4.58
July, "	379	15	12	14	145,000	4,677	83,484,000	2,693,032	14.59	2.76
August, "	369	15	11	55	149,400	4,820	81,189,000	2,619,000	14.03	5.93
September, "	304	20	10	09	131,900	4,397	67,385,100	2,246,170	13.75	1.50
October, "	317	20	10	14	131,700	4,248	70,279,800	2,267,090	12.91	0.67
November, "	295	45	9	51	126,800	4,227	60,860,700	2,028,690	12.30	2.99
Total.	4,041	15	..	..	1,715,200	. . .	887,820,900	. . . .	. . .	38.88
Daily Average.	11	4	..	..	4,699	. . .	2,432,386	. . . .	14.234	

Stock on Hand, December 1, 1879.

688 tons Cumberland coal; 13 gallons valvoline oil; 11 gallons machine oil; 6 gallons kerosene; 1½ gallons benzine; ¾ gallon boiled oil; 1 gallon raw linseed oil; ¾ gallon oil polish; 25 pounds tallow; 15 pounds cotton waste; 25 pounds rubber packing; 20 pounds hemp packing; 5 pounds Tuck's packing; 3 pounds Silver Lake packing; 3 pounds asbestos packing; 24 9-inch rubber valves; 2 valve seats; 2 steam-gauges; 10 pounds Babbitt metal; 2 pounds solder; 3 pounds red lead; 3 pounds mercury; 15 pounds steel; 5 pounds sheet brass; 1½ bales hair felt; 40 pounds soap; 2 brooms; 15 feet 5-inch rubber belting; 6 files; 2 pounds emery; ½ quire emery-cloth; 10 gauge-glasses; 15 lamp-chimneys; 3 dozen lamp-wicks; 3 lantern-globes; 1 barrel cement; 1 barrel kaolin; ¼ barrel brimstone; 12 grate-bars; 300 fire-brick; 500 common brick; 10 pounds nails; 300 pounds bolts and nuts; 1 pair plungers and rings for No. 2 engine; 20 feet 2-inch brass pipe; 30 feet 1½-inch brass pipe; 7 feet ½-inch brass pipe; 12 feet ¼-inch brass pipe; 6 feet 3-inch iron pipe; 30 feet 1½-inch iron pipe; 40 feet 1¼-inch iron pipe; 40 feet ¼-inch iron pipe; 3 1½-inch globe-valves; 46 elbows; 19 Ts; 13 unions; 23 nipples; 35 plugs; 37 couplings; 2 crosses; 24 bushings; 10 feet 24-inch flange pipe; 8 feet 6-inch flange pipe.

Tools, Furniture, and Instruments.

1 engine lathe; 1 lathe chuck; 6 lathe tools; 6 lathe dogs; 1 grindstone; 1 3-inch by 9-inch engine, with shafting, belting, &c.; 1 vise; 1 vise-bench; 1 set pipe-dies; 1 set pipe-taps; 1 set hand-taps; 2 pipe-cutters; 14 pairs pipe-tongs; 2 hand-hammers; 1 copper hammer; 18 cold chisels; 8 files; 5 screw wrenches; 1 hack saw; 1 Stillson wrench; 21 fork wrenches; 27 socket wrenches; 1 hydrant wrench; 6 gate wrenches; 2 clamp-screws; 1 sledge; 2 ratchets; 18 drills; 1 breast-drill; 2 jack-screws; 6 steel bars; 1 crowbar; 2 soldering-irons; 4 cylinder-head cranes; 1 level; 1 gasket-cutter; 2 ladles; 12 eyebolts; 75 starting-bolts; 2 starting-keys; 1 chain fall; 2 wooden horses; 1 oil cabinet; 1 set measures; 1 6-gallon can; 3 1-gallon cans; 3 3-gallon cans; 2 lamp-fillers; 2 funnels; 6 squirt cans; 1 oil pump; 1 carpenter's bench; 4 planes; 4 hand-saws; 10 chisels;

7 gouges; 3 screw-drivers; 1 bit-stock; 12 bits; 3 augers; 1 draw-knife; 1 spoke-shave; 1 axe; 2 mallets; 1 saw-set; 1 steel square; 1 set fire tools; 1 coal-car; 1 pair platform scales; 2 wheelbarrows; 12 scoop-shovels; 12 long-handle shovels; 2 short-handle shovels; 2 tube-brushes; 6 picks; 1 forge; 1 anvil; 5 pairs tongs; 3 hand-chisels; 1 lawn-mower; 2 steel rakes; 2 wooden rakes; 2 scythes; 2 forks; 1 manure-fork; 1 prong hoe; 1 weeder; 1 spade; 1 scythe-stone; 6 ladders; 3 step-ladders; 1 cast-iron roller; 200 feet 2-inch linen hose and hose pipe; 100 feet ¾-inch hose and hose pipe; 1 desk; 2 tables; 2 clocks; 18 chairs; 9 mats; 1 lot matting; 6 spittoons; 1 water-cooler; 6 fire-pails; 7 water-pails; 4 bracket-lamps; 6 lanterns; 2 hand-lamps; 1 watering-pot; 1 dust-pan; 2 dust-brushes; 1 window-brush; 2 floor-brushes; 4 scrubbing-brushes; 1 feather duster; 2 mops; 1 barometer; 1 hygrophant; 1 thermometer; 2 rain gauges; 1 snow gauge.

List of Meters in use November 30, 1879.

[illegible]	Locality.	Size.	Description.
		Inch.	
American Net and Twine Co.	Third St.	1½	Worthington.
American Steam Safe Co.	Main St.	[illegible]	"
Agassiz Museum	Divinity ave.	[illegible]	"
Boston & Albany R. R.	Putnam ave.	1½	"
Boston & Lowell R. R. Roundhouse	Prison Point St.	[illegible]	"
" " " Repair Shop	" " "	[illegible]	"
" " " New Roundhouse	" " "	[illegible]	"
" " " Paint Shop	" " "	[illegible]	"
" " "	" " "	[illegible]	Union Rotary
[illegible]	Broadway	[illegible]	" "
Boston Chemical Works	Third St.	[illegible]	Worthington.
[illegible]	Broadway	[illegible]	"
Boston [illegible] Co.	Third St.	[illegible]	"
Boston Woven Hose Co.	Portland St.	[illegible]	"
[illegible]	Broadway	[illegible]	"
[illegible]	Main St.	1	"
[illegible] & Co.	[illegible] St.	[illegible]	"
[illegible] & Son	Broadway	[illegible]	"
[illegible] Co.	[illegible] St.	[illegible]	"
[illegible] & Co.	[illegible] St.	[illegible]	Bal. & Fitts.
[illegible]	[illegible]	[illegible]	Worthington.
Cambridgeport [illegible] Co.	[illegible] St.	[illegible]	"
Cambridge Gas-Light Co.	Third St.	[illegible]	"
City of Cambridge [illegible]	[illegible] ave.	[illegible]	"
" " " [illegible] Building	[illegible] St.	[illegible]	"
" " " [illegible] Building	[illegible]	[illegible]	"
" " " Cambridge Cemetery	Coolidge ave.	[illegible]	"
" " " Almshouse	[illegible] St.	[illegible]	"
[illegible] Brothers	[illegible] St.	[illegible]	[illegible]
[illegible]	[illegible] ave.	[illegible]	Worthington.
[illegible] Brothers	[illegible] St.	[illegible]	"
[illegible]	[illegible] St.	[illegible]	"
[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible] St.	[illegible]	"
[illegible] & [illegible]	Broadway	[illegible]	"
[illegible] & Son		[illegible]	"
[illegible]	[illegible] St.	[illegible]	"
[illegible]	Broadway	[illegible]	"
[illegible] Co.	[illegible] St.	[illegible]	"
[illegible]	[illegible]	[illegible]	"
[illegible] & Co.	[illegible] St.	[illegible]	"
[illegible]	[illegible] St.	[illegible]	"
[illegible]	Cambridge St.	[illegible]	"
[illegible]	[illegible] St.	[illegible]	"
[illegible]	[illegible] St.	[illegible]	"
[illegible]	Broadway	[illegible]	"
[illegible] & [illegible]	[illegible] St.	[illegible]	"
[illegible] & Co.	Cambridge St.	[illegible]	"
[illegible] Brothers	[illegible] St.	[illegible]	"
Harvard College Divinity Hall		[illegible]	"
" " [illegible] Hall	Quincy St.	[illegible]	"
" " Gymnasium		[illegible]	"
" " [illegible]		[illegible]	"
" " Thayer Hall		[illegible]	"
" " University Hall		[illegible]	"

List of Meters in use November 30, 1879 — Continued.

METERS.	Locality.	Size.	Description.
		Inch.	
Harvard College (Stoughton Hall)	. . . .	⅝	Worthington.
„ „ (Memorial Hall)	Cambridge St.	2	„
„ „ (Boat-house)	Flagg St.	¾	Ball & Fitts.
„ „ (Holyoke House)	Harvard St.	2	Worthington.
„ „ (Botanical Garden)	Garden St.	1	„
Harvard Laundry	Douglass St.	¾	Ball & Fitts.
Haslett, W. H.	Green St.	1	Worthington.
Houdlette & Ellis	Portland St.	2	„
Houghton, H. O., & Co.	Blackstone St.	1	„
„ „ „	„	⅝	„
Hews, A. H. & Co.	Crescent Ave.	1	„
Hale, Teele, & Bisbee	Davis St.	1	„
Hixon, E.	Harvard St.	⅝	„
Hovey's Nursery	Cambridge St.	1	„
Jones, C. L. & Co.	Pearl St.	¾	„
Jaynes & Co.	Pacific St.	⅝	Ball & Fitts.
Kennedy, F. A.	Green St.	1	Union Rotary.
Kemp & Son	Davis St.	1	Ball & Fitts.
Kendall & Roberts	Main St.	¾	Worthington.
Kershaw & Co.	Hampshire St.	1	„
Little, Brown, & Co.	Blackstone St.	1	„
Low, J. W.	Reed St.	1½	„
Lincoln & Chamberlain	Distillhouse St.	2	„
Mount Auburn Corporation	Brattle St.	1	„
„ „ „	Mt. Auburn St.	1½	„
Mason & Hamlin Organ Co.	Broadway	1	„
Middlesex Bleachery	Sacramento St.	¾	„
Moering, Mrs. A. L.	Main St.	1	„
Murdock, Walter H.	Hews St.	⅝	Désper.
Middlesex County (House of Correction)	Thorndike St.	2	Worthington.
„ „ (Court-house)	„ „	¾	Ball & Fitts.
„ „ (Court-house)	Otis St.	¾	„ „
„ „ (Registry of Deeds)	„ „	¾	Worthington.
New England Glass Co.	North St.	2	„
Norton, E. & Son	Winsor St.	⅝	„
Porter's Hotel	North Ave.	⅝	Désper.
Page, George G. & Son	Hampshire St.	2	Worthington.
Pike, James	Church St.	1	„
„ „	Farwell Place	¾	„
Perry, C. E.	Raymond St.	¾	„
Ross, Mrs. H. P.	Broadway	⅝	„
Revere Sugar Refinery	Water St.	3	„
„ „ „	„ „	3	Union Rotary.
Reardon, John, & Son	Allston St.	4	Worthington.
Reversible Collar Co.	Arrow St.	1	„
Rogers, George M.	Washington St.	3	„
Rhoades, Silas, & Son	State St.	2	„
Shaw & Applin	Bridge St.	1½	„
Sortwell & Co.	Distillhouse St.	2	„
Squire, John P. & Co.	Gore St.	2	„
„ „ „ „	„ „	2	„
„ „ „ „	„ „	1	„
Sands, John L.	Walden St.	¾	„
St. Mary's School	Harvard St.	¾	„

List of Meters in use November 30, 1879 — Concluded.

METERS.	Locality.	Size.	Description.
		Inch.	
St. Mary's School (Catholic Church)	Norfolk St.	2	Worthington.
Stiles, John C.	Cambridge St.	2	"
" " "	Inman Sq.	⅝	Desper.
Shorey, George L.	Soden St.	1½	Worthington.
Scorgie, Wight, & Co.	Mt. Auburn St.	¾	"
Thayer, Henry, & Co.	Broadway	2	"
Tower, Sylvester	"	1	"
Tug "Henry Chapel"	First St.	2	"
Union Railway	Cambridge St.	1	"
" " (Washing Cars)	Dunster St.	¾	"
" " (Engine Room)	" "	¾	"
" " (New Car House)	" "	⅝	"
" " (Wooden Stable)	" "	¾	"
" " (Brick Stable)	" "	1½	"
" "	Mt. Auburn St.	1	"
" "	Main St.	1	"
" "	North Ave.	2	"
" "	Baldwin St.	1	"
" "	Cambridge and Baldwin Sts.	1	"
" "	River St.	1	"
Union Glass Co. (Packing room)	Webster Ave.	⅝	Ball & Fitts.
" " " (Pot room)	" "	1	Worthington.
Uhrig, Joseph	Main St.	1½	"
Wyeth, H. M.	Dublin St.	⅝	"
Walworth Manufacturing Co.	Main St.	1½	"
Woodbury & Co.	Otis St.	2	Ball & Fitts.
Wilson, John, & Son	Brattle St.	1	Worthington.
Woods, George, & Co.	Main St.	2	"

List of Drinking-Fountains, November 30, 1879.

Bridge Street, junction of Cambridge Street.
Broadway, south-west corner of Norfolk Street.
Brattle Square, east side of Brewer's Block.
Brattle Street, junction of Fresh Pond Lane.
Cambridge, south corner of Fifth Street.
Central Square, west side.
Central Square, east side.
Fort Washington.
Hampshire Street, junction of Broadway.
Inman Square, east side.
Main Street, junction of Front Street.
Main Street, junction of Mt. Auburn Street.
North Avenue, south-west corner of Walden Street.
North Avenue, north side, west of Cameron Street.
Putnam Avenue, south-west corner of Pearl Street.

Third Street, west side, north of Main Street.
Harvard Square at the flag-staff.

List of Stand-Pipes (for Street-Watering) Nov. 30, 1879.

Brattle Street, near University Press.
Brattle Street, corner of Sparks Street.
Brattle Street, near Fayerweather Street.
Brattle Street, near Fresh Pond Lane.
Bridge Street, junction of Cambridge Street.
Broadway, near Third Street.
Broadway, corner of Sixth Street.
Broadway, corner of Winsor Street.
Broadway, junction of Hampshire Street.
Brookline Street, corner of Putnam Avenue.
Cambridge, near Warren Street.
Cambridge, near Winsor Street.
Cambridge, at Inman Square.
Columbia, near Austin Street.
Concord Avenue, at junction of Garden Street.
Dana, at corner of Chatham Street.
Dublin, near Fitchburg Railroad.
Fifth, near Thorndike Street.
Gore, west of Third Street.
Green, near Western Avenue.
Harvard, corner of Prescott Street.
Inman, near Broadway.
Kirkland, near Quincy Street.
Main, near Portland Street.
Main, near Hancock Street.
Magazine, opposite Warland Street.
Mount Auburn, near Athens Street.
North Avenue, near Common.
North Avenue, corner of Sacramento Street.
North Avenue, near Forest Street.
North Avenue, near Beech Street.
North Avenue, near Spruce Street.
North Avenue, corner of Norris Street.
North Avenue, opposite Tannery Street.
Third Street, near Rogers Street.
Thorndike, near Third Street.
Western Avenue, near Howard Street.

New Main Pipe laid for Extensions and Renewals, from Dec. 1, 1878, to Nov. 30, 1879, inclusive, with the Number of Gates and Fire Hydrants used.

LOCATION.	Iron Pipe.		Gates.		Fire Hydrants.	
	Size.	Length.	No.	Size.	No.	Size.
	Inch.	Feet.		Inch.		Inch.
Sparks Street, near Vassal Lane	6	593	..	..	..	..
Garden Street, near Botanic Garden	6	486	1	6	..	..
Allen Street	4	133	..	..	..	..
Appleton Street	6	186	..	..	..	..
Orchard and Russell Streets	..	..	1	4	..	..
Austin Street, south of Columbia St.	6	86	1	6	..	..
Saville St.	4	40	..	..	..	..
School Street, between Pine and Austin Streets	4	224	..	..	..	..
Bow Street, east from Plympton Street	4	26	..	..	..	..
Plympton Street, from Bow to Harvard	4	386	2	4	..	..
Spring Street, corner of Sixth Street	..	..	..	..	1	6
Harris Street, near Somerville Line	4	120	..	..	..	.
Harvard Street, near Dunster Street	6	50	..	..	1	6
Blanche Street, between Front and Franklin Streets	4	196	1	4	..	..
First Street, between Otis and Thorndike (renewal)	6	312	..	..	1	6
Valentine and Brookline Streets	..	..	1	8	..	..
Decatur and Brookline Streets	..	..	1	8	..	..
Lopez and Brookline Streets	..	..	1	4	..	..
First Street, between Otis and Thorndike Sts. (raised)	6	177	..	..	..	..

Recapitulation.

	6 in.	4 in.	8 in.	Total Length.
Length of iron pipe in feet	1,713	1,125	..	2,838
Number of gates	2	5	2	9
" " hydrants	3	..	..	3
Length of iron pipe raised	177	..	..	177

New Supplies.

GALVANIZED PIPE AND BRASS FITTINGS USED FROM DEC. 1, 1878, TO NOV. 31, 1879, INCLUSIVE.

	4 in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	Total.
	Cast-iron.						
Length galvanized pipe	21	353	110	581	524	4,959	6,548
Number of supplies	1	3	1	3	4	113	125
" stop and wastes	..	3	..	4	4	114	125
" screw cocks	..	3	1	4	4	101	113
" sidewalk cocks	..	..	..	..	4	113	117
" gates	1	..	..	..	..	..	1
" faucets	..	..	..	..	..	14	14
" stand-pipes	..	..	..	..	..	..	113

Stock in Shop and at the Yard.

1 large boom-derrick.
3 post-hydrants.
4 garden-hydrants.
4 hydrant-boxes.
2 lead-kettles and furnaces.
2 horses.
4 blankets.
1 pung.
1 large hand-pump.
9 pails.
2 casks of cement.
1 drilling-machine.
8 pipe-cutters.
8 pair of tongs.
4 blow-off wrenches.
2 hydrant-wrenches.
1 1½" meter.
3 ⅝" meters.
3 1"-meter dials.
2 1½" counters and ratchet movements.
3 ⅝" counters and ratchet movements.
222 seals.
2 small derricks.
4 chains.
33 old flush-hydrants.
4 large gate-boxes.
4 harnesses.
1 hay-cutter.
1 double-runner sled.
21 picks.
16 lanterns.
1 platform scale.
1 lathe, with the usual chucks and tools.
1 water-motor.
9 pipe-wrenches.
14 gate-wrenches.
2 1"-cock wrenches.
2 bench vises.
1 1" meter.
6 2" meter dials.
6 ⅝" meter dials.
2 drinking-fountains.
4 tool-chests.
2 meter-boxes.
6 small gate-boxes.
28 rises for gate-boxes.
2 oil-covers for horses.
4 wagons.
2 hand-carts.
8 thawing-pumps.
6 rammers.
1 set of pipe-taps, from ⅛" to 2".
1 pipe-threading machine, with dies from ½" to 2".
4 plates, from ½" to 1".
3 monkey-wrenches.
3 2"-cock wrenches.
12 sidewalk-cock wrenches.
2 2" meters.
3 ¾" meters.
2 1½" meter dials.
3 2" counters and ratchet movements.
1 1" counter and ratchet movements.
664 pounds lead.

Statement of Stock on Hand December 1, 1879.

FOR STREET MAINS (IRON PIPE AND FITTINGS).

NUMBER OF —	48 in.	30 in.	24 in.	20 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Straight pipes (12 feet each)	2	25	28	18	4	24	107	16	241	5	8
Elbows	..	..	..	..	..	..	..	..	..	4	..
Bends (1–36″) . . .	..	..	2	2	1	..	4	..	15	..	..
Y branches	..	..	1	..	..	1	..	..	..	..	..
Sleeves	..	2	4	8	5	8	8	2	6	5	.
Clamp sleeves . . .	..	..	8	2	..	4	4	5	5	8	8
Drain offsets . . .	..	..	..	..	..	..	..	..	24	..	..
Offsets	..	..	..	..	..	..	6	..	16	..	..
Gates	..	..	..	..	..	8	1	..	1	2	2
Check-valves (old) .	..	..	2	..	..	..	..	..	..	..	..
Blow-offs	..	..	..	2–6″	2–6″	..	..	..	..	..	..
Caps	..	..	2	..	..	7	8	1	8	2	..
Plugs	..	..	..	..	..	..	..	..	..	..	..
Crosses	..	..	..	2–10″	1–12″	4–8″	8–6″	8–8″	9–4″	2–3″	..
	..	..	..	1–20″	..	1–4″	2–8″	1–8″	..	15–4″	..
	..	..	..	..	..	8–6″	2–10″	..	..	..	..
	..	..	..	..	..	5–10″	..	..	..	..	..
Reducers . . .	..	..	1–10″	2–12″	..	2–10″	4–6″	1–6″	..	5–3″	..
	..	..	1–8″	1–8″	..	..	2–8″	..	..	..	..
Ts	..	..	8–6″	2–12″	7–6″	1–12″	19–6″	12–6″	18–6″	1–3″	..
	..	..	1–8″	8–20″	..	5–6″	..	..	1–4″	7–4″	..
	..	..	1–24″	2–6″	..	..	..	..	..	..	..

For Supplies (Galvanized Pipe and Brass Fittings).

	2½ in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
Length of galvanised pipe	..	468 4 Cast-iron.	126	405	55 5 Cast-iron.	. 10 Cast-iron.	.. 30 Cast-iron.
Elbows	2	..	46	75	44	60	..
Street Elbows	..	..	..	..	10	74	..
Couplings	2	112	4	20	170	18	120
Unions for lead pipe	..	..	..	..	..	7	..
Unions	..	9	20	22	14	44	..
Stop and waste cocks	..	..	3	2	24	33	..
Screw-cocks	..	..	2	5	2	9	..
Corporation cocks	..	..	5	..	59	2	..
Screw-cocks for cement pipe	..	..	..	..	..	..	..
Sidewalk-cocks	..	..	..	..	46	14	..
Blow-off cocks	..	..	..	..	..	..	.
Hydrant cocks	..	..	2	..	..	3	..
Sill-cocks	..	..	..	..	..	3	..
Hose-bibbs	..	..	..	..	13	3	7
Air-chambers	..	..	..	..	48	20	60
Socket-ends	..	..	..	..	6	110	..
Lock-nuts	..	..	..	..	40	40	..
Nipples	2	48	20	90	12	14	120
Hose-nipples	..	..	..	..	..	..	..
Plugs	..	1	6	10	82	..	..
Bushings	6-1¼"	6-1" 10-1¼"	12-1¼"	6-¾" 4-1"	..	..	..
Clips	..	..	..	..	40	10	..
Ts, malleable	..	..	..	1	1	168	60
„ cast-iron	..	320	185	125	141	490	10
Crosses, cast-iron	..	85	124	102	100	47	..
Reducing couplings	..	..	..	..	..	124-½"	..
Caps	..	..	..	..	..	..	10

EXPENDITURES OF WATER WORKS.

From the Auditor's Report.

Water Works (Construction).

Amount appropriated		$8,000.00

EXPENDED.

For Borings, experimental	$722.00	
Castings	28.71	
Civil engineer's expenses	71.78	
Engineer, expert services	1,500.00	
Hydrant boxes	52.33	
Hydrants	291.70	
Labor, as per pay-roll	498.72	
Land damages	95.00	
Lathe and fittings	357.30	
Lead	68.99	
Meters	453.23	
Sled, pipe-yard	23.00	
Teaming	10.00	
Trees	182.00	
Valves	69.80	
Total, as per item No. 44 of expenses		$4,424.56
Balance unexpended		$3,575.44

Water Works (Maintenance).

Amount appropriated	$2,440.00
Add amount transferred	23,560.00
Amount carried forward	$26,000.00

Amount brought forward		$26,000.00
RECEIVED.		
For Amount recovered on A. F. Fifield's bond, as per item No. 38 of receipts		1,250.00
		$27,250.00
EXPENDED.		
For Advertising	$25.25	
Analyses of water	75.00	
Auditing books	45.00	
Belting	32.69	
Boxes, meter, and gate	559.92	
Brick	10.40	
Car tickets and fares	125.00	
Clerical assistance in office	1,032.00	
Clerk of Board, salary	199.98	
Engine-house, painting	67.34	
Expressage and teaming	120.29	
Fertilizer	210.70	
Fuel	3,523.85	
Furniture repairs	10.24	
Gate-house, painting	26.00	
Gravel and stone	66.37	
Hardware and tools	268.45	
Harnesses and repairs	84.80	
Hay, grain, and straw	240.10	
Horse	100.00	
Horse-hire	20.00	
Horse-keeping	284.93	
Horse-shoeing	65.37	
Hose and packing	44.89	
Inspectors, services	1,158.00	
Labor, as per pay-roll	8,328.78	
Lime and cement	122.40	
Lumber	97.64	
Mason's work	26.88	
Meters, repairs	168.24	
Oil and waste	357.18	
Amounts carried forward	$17,497.69	$27,250.00

Amounts brought forward	$17,497.69	$27,250.00
Paving and grading	24.35	
Pipes and fittings	779.25	
Plugs, painting	23.70	
Plumbing	22.20	
Printing	76.38	
Pump, use of	104.00	
Rails and spikes	74.49	
Registrar, J. W. Cotton, salary (13 months)	2,166.66	
Rent of office and shop	600.00	
Rent of safety vault	20.00	
Rent of wharf	50.00	
Repairs, general	187.14	
Report, stenographic	25.00	
Reservoir, repairs	1,909.78	
Stand-pipe, painting	75.12	
Stationery and blank books	175.04	
Superintendent, Hiram Nevons, salary	1,800.00	
Telephone, use of	20.00	
Tools, repairs	178.48	
Trees, planting	34.00	
Wagons, repairs	120.80	
Whitewashing	29.00	
Total, as per item No. 45 of expenses		25.993.08
Balance unexpended		$1,256.92

Water Works (Rates, Fines, &c.).

RECEIVED.

For amount of rates, fines, &c., as per item No. 39 of receipts	$167,375.51
Deduct amount transferr	160,000.00
	$7,375.51

EXPENDED.

For water rates refunded, as per item No. 46 of expenses	$1,566.96
Balance unexpended	$5,808.55

Water Works (Supplies).

RECEIVED.

For supply pipes and fittings, as per item No. 40 of receipts		$2,883.17
Deduct amount transferred		1,000.00
		$1,883.17

EXPENDED.

For Amount refunded	$9.50	
Labor, as per pay-roll	698.70	
Supply pipes and fittings	826.00	
Total, as per item No. 47 of expenses		1,534.20
Balance unexpended		$348.97

CAMBRIDGE WATER BOARD, 1880.

GEORGE P. CARTER . . . . *President.*

Members of Board.

THE MAYOR,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

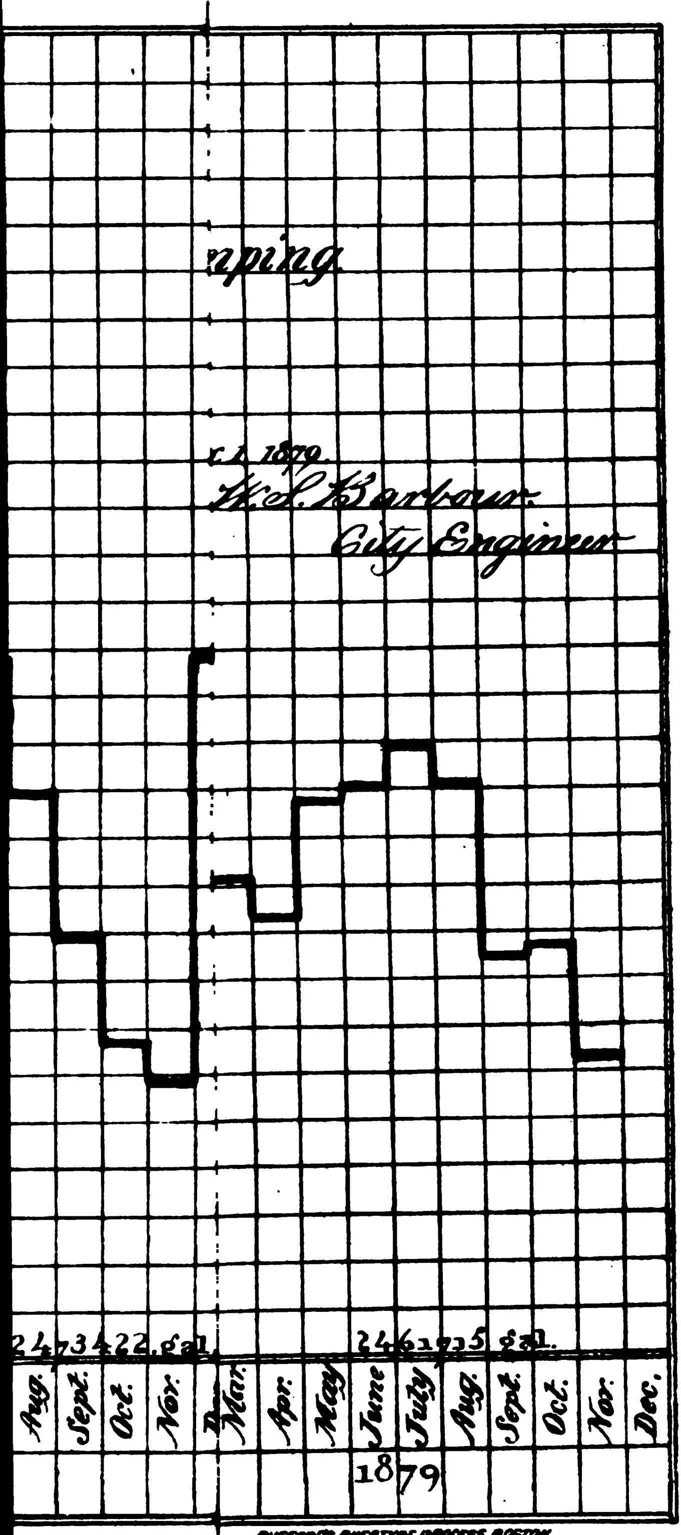
GEORGE P. CARTER,	*term expires*	1884.
HENRY L. EUSTIS,	,, ,, ...	1883.
CHESTER W. KINGSLEY,	,, ,, ...	1882.
J. WARREN MERRILL,	,, ,, ...	1881.
KNOWLTON S. CHAFFEE,	,, ,, ...	1880.

JUSTIN A. JACOBS, *Clerk.*

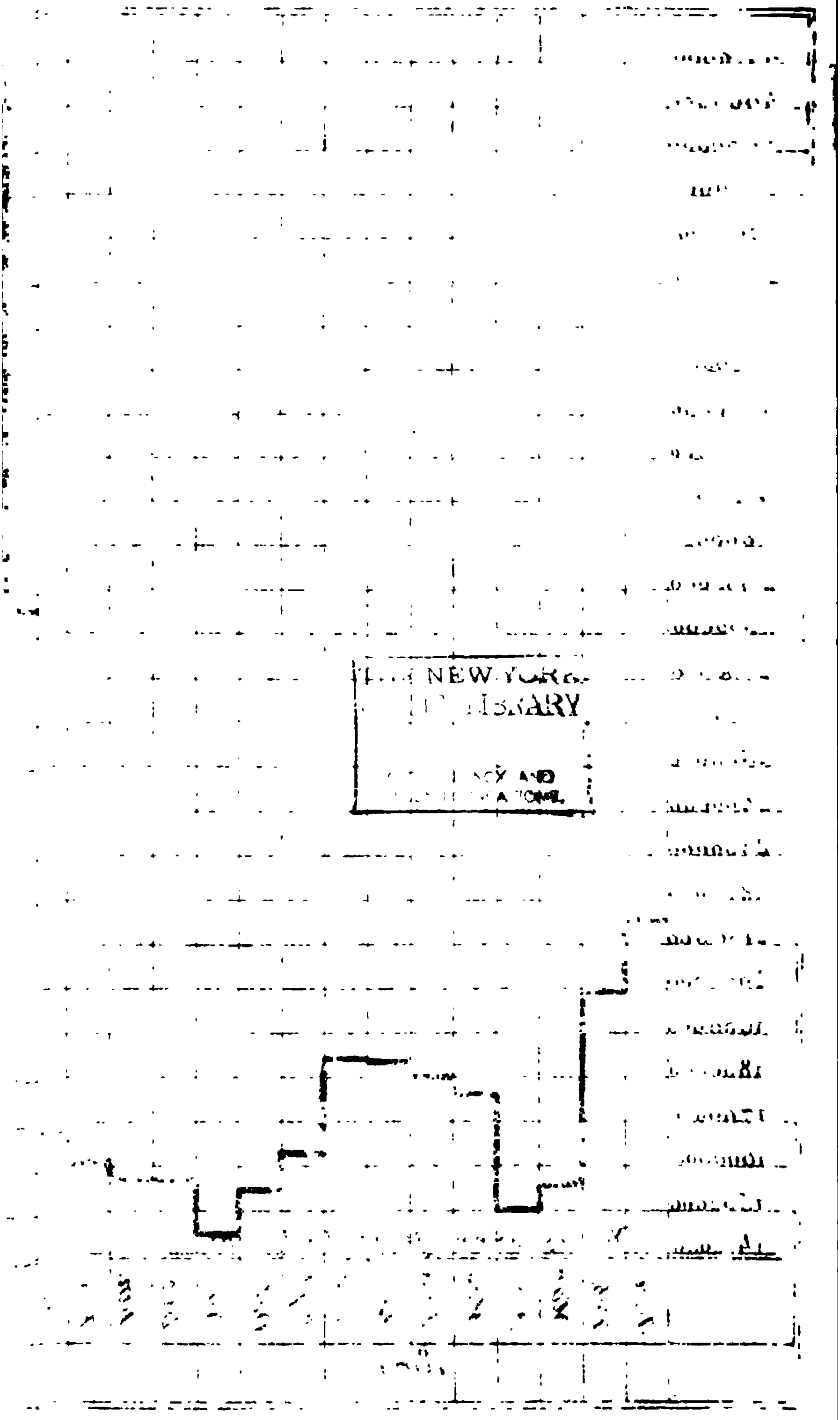
HIRAM NEVONS, *Superintendent of Works.*
J. WARREN COTTON, *Water Registrar.*

Trustees of Sinking-Fund of Water Loan.

THE MAYOR.
CITY TREASURER,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*



BUFFORD'S PHOTOTYPE PROCESS BOSTON.



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SIXTEENTH ANNUAL REPORT

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL,

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS,

FOR THE YEAR 1880.

CAMBRIDGE:
TRIBUNE PUBLISHING COMPANY.
1881.

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MVN

☆ CAMBRIDGE PUB. LBRY

REPORT

OF THE

CAMBRIDGE WATER BOARD.

To the Honorable City Council of the City of Cambridge:

THE Cambridge Water Board herewith submits to you its Sixteenth Annual Report, in accordance with the city ordinance.

Total Cost of the Works.

Cost of the Water Works, Nov. 30, 1879, as per last year's report	$1,696,596 50
Expended on construction during the year ending Nov. 30, 1880	25,234 04
Total expenditure	$1,721,830 54

Net Cost of the Water Works.

Total cost as above stated	$1,721,830 54
Less amount of the water loan paid from the water debt sinking fund to Nov. 30, 1880	186,400 00
Leaving unpaid water debt	$1,535,430 54
Deduct from this the value of the water loan sinking fund, as shown by the Trustees' account	414,568 48
Showing the net cost of the works Nov. 30, 1880 . . .	$1,120,862 06

Statement showing in brief the transactions on account of the Water Works for the year ending Nov. 30, 1880 : —

Received.

Appropriation for construction account		$30,000 00
From water rates	$174,739 12	
Less water rates refunded	1,413 63	
		173,325 49
Shutting off and letting on water, and fines		879 47
Rent of house		144 00
From supply account		3,762 52
		$208,111 48

Expended.

For construction account	$25,234 04
For maintenance account	25,865 49
For supply account	1,995 21
Interest on water debt	91,585 00
Paid into the sinking fund	45,855 00
Unexpended appropriation	4,765 96
Balance showing gain in 1880	12,810 78
	$208,111 48

Comparative Receipts.

Water rates for the year ending Nov. 30, 1880	$173,325 49
Water rates for the year ending Nov. 30, 1879	164,681 90
Showing gain in 1880	$8,643 59
The above increase was made after a reduction had been made during the year in the water rates of	$16,585 50
Deduct additional sum allowed on hydrants	11,210 00
Showing net loss by reducing the water rates	$5,375 50
Add the gain in receipts as stated above	8,643 59
Showing the real comparative gain to have been in 1880	$14,019 09

Water Bond Account.

Whole amount of water bonds issued	$1,714,900 00
Less amount paid from sinking fund	186,400 00
Leaving the amount of unpaid water bonds	$1,528,500 00
Total cost of works as herein shown	$1,721,830 54
Less amount paid from sinking fund	186,400 00
Showing the unpaid cost of the water works	$1,535,430 54

Deduct the amount of unpaid water bonds	$1,528,500 00
And the unpaid cost of the water works exceeds the unpaid water bonds by the sum of	$6,930 54
This is because the amount expended this year, for which no bonds were issued, is in excess of the amount due the water works, reported last year as balances lapsed into the city treasury from receipts from sale of water bonds, being	$25,234 04
Amount reported last year	18,303 50
Difference as above	$6,930 54

By the terms of our charter, Acts 1865, Chap. 153, Sect. 8, it is provided in reference to the "Cambridge Water Loan," that "the net surplus, income, and receipts, after deducting all expenses and charges for distribution, shall be set apart as a sinking fund, and applied only to the payment of the principal and interest of said loan." This requirement was certainly in force until 1875, when the Legislature in Acts 1875, Chap. 145, Sect. 2, required that thereafter, not less than three per cent of the amount of the water debt should be carried annually to the sinking fund.*

There is a large sum which should be carried to the sinking fund of the water loan, as shown in the registrar's account, made up from the balances of receipts which have lapsed into the city treasury, instead of being added to the sinking fund.

The registrar has gone over these accounts the past year in detail, and the result of his examination shows that there is due the water loan sinking fund, including the balance of interest, the sum of $148,030.08. We would suggest that you appoint the city auditor or a committee to examine the registrar's account, or otherwise examine the subject, to the end that the requirements of the Legislature be complied with, and the sinking fund appear as it should in the city accounts.

As our sinking fund was based upon six per cent interest, and that rate cannot be realized, we would further suggest to you the propriety of adding to the sinking fund any surplus over the three per cent required, as a set-off for this loss in interest.

---

* See Registrar's Report, *post*.

Comparative Rainfall and Height of Water in the Pond.

MONTHS.	Rainfall.			Below high-water mark.		
	1878.	1879.	1880.	1878.	1879.	1880.
	Inches.	Inches.	Inches.	Feet.	Feet.	Feet.
December, 1879	0.84	4.39	3.76	2.20	2.15	4.87
January, 1880	5.84	2.20	2.62	2.00	2.25	4.87
February, "	6.59	3.43	3.49	1.66	2.92	4.60
March, "	4.17	4.02	2.85	0.75	2.72	4.14
April, "	5.15	5.65	1.94	0.68	1.62	3.90
May, "	0.87	1.28	1.44	0.75	1.50	4.44
June, "	2.68	4.59	0.73	1.42	1.79	5.38
July, "	4.82	2.64	6.49	2.29	2.27	6.29
August, "	6.21	5.79	3.48	2.27	2.79	6.79
September, "	2.24	1.71	1.63	2.63	3.11	7.46
October, "	5.06	0.76	2.63	3.08	3.97	8.03
November, "	6.52	3.18	2.25	3.00	4.58	8.33
Total	50.99	39.64	33.31	Av. 1.89	Av. 2.64	Av. 5.76

It will be seen that we had 6.33 inches less rainfall in 1880 than in 1879, and 17.68 inches less than in 1878, and as a result we have 3.75 feet less water in the pond than at the close of last year. As the amount of water pumped in 1880 was not as much as in 1879, this difference in the height of water must be accounted for by the lack of rainfall the past two years, the average rainfall for this region being about 49.5 inches.

The engineer's report shows that we pumped in 1880, 886,898,400 gallons, being 922,500 gallons less than the amount pumped in 1879. The amount of coal used in 1880 was 1,618,800 pounds, being 96,400 pounds less than the amount used in 1879.

Great efforts have been made during the past year to ascertain and stop all leaks and waste of the water; and to show that these efforts have not been without good results, we note that while the amount pumped has been nearly a million gallons less than last year, we have at the same time sold by meter more than 20,000,000 gallons more than last year, put in 139 new supplies, and supplied many houses with water that were

City of Cambridge.

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1899.

THE SIXTEENTH ANNUAL REPORT OF THE CAMBRIDGE WATER BOARD TO THE CITY COUNCIL,

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS,

FOR THE YEAR 1880.

CAMBRIDGE:
TRIBUNE PUBLISHING COMPANY.
1881.

in former reports; but now, re-enforced as we are by the judgment of such eminent authority, we must again urge this matter upon your practical consideration. This territory is now all in the city of Cambridge, and want of jurisdiction can no longer be urged as a reason for further delay. The importance and necessity of this sewer have been conceded by all who have examined the subject, and its neglect has been a just cause of complaint against the city by our water takers.

During the past year, the water in the pond has been very low, and the shores have been laid bare to an unprecedented extent. A large amount of work has been done in the way of cleaning up the borders of the pond. The drainage from Peat Pond, which was very objectionable, has been stopped by putting down a drain pipe leading into the sewer near the Pumping House; and all that section of the pond from the Boat House around the cove, about which so much was said last winter at the State House, has been cleaned up around the borders, and now presents a comparatively neat appearance.

The board thought the present a good opportunity to put up some dams, which would shut off in a measure some of the most objectionable nooks around the pond. It was only intended to put up gravel banks, through which the water would freely percolate, and while such banks were not expected to keep out of the pond any bad matter that might be in solution, yet it would keep out anything of this kind that might be in suspense, or floating on the surface. The amount of the latter that catches on our screens, shows that there is a call for this protection, as it grows to a large extent on the south and southwest parts of the pond, and is driven over towards our conduit by the prevailing winds. Of course but a small part of this material finds its way into our conduit, but the rest must ultimately sink in the water and decompose in that part of the pond nearest our engine-house, from which we constantly draw water.

We made application to the City Council for an appropriation of $5,000 to enable us to do this work, which, upon visiting the pond and seeing the necessity of its being done, you promptly granted; afterwards, when it was found it might involve a further expense in land damage (which we reported to you as soon as it came to our knowledge), you withheld your

REPORT

OF THE

CAMBRIDGE WATER BOARD.

To the Honorable City Council of the City of Cambridge:

THE Cambridge Water Board herewith submits to you its Sixteenth Annual Report, in accordance with the city ordinance.

Total Cost of the Works.

Cost of the Water Works, Nov. 30, 1879, as per last year's report	$1,696,596 50
Expended on construction during the year ending Nov. 30, 1880	25,234 04
Total expenditure	$1,721,830 54

Net Cost of the Water Works.

Total cost as above stated	$1,721,830 54
Less amount of the water loan paid from the water debt sinking fund to Nov. 30, 1880	186,400 00
Leaving unpaid water debt	$1,535,430 54
Deduct from this the value of the water loan sinking fund, as shown by the Trustees' account	414,568 48
Showing the net cost of the works Nov. 30, 1880	$1,120,862 06

Statement showing in brief the transactions on account of the Water Works for the year ending Nov. 30, 1880: —

amount furnished by the pond itself, we think, will be nearly shown by the following calculations based on these facts: —

		Gallons.
Whole amount of water pumped during the year		886,898,400
Deduct amount pumped in March, 31 days .	67,757,400	
Deduct amount pumped in April, 30 days .	65,006,700	
Deduct amount pumped in May, 31 days . .	87,130,800	
Deduct gain in these months, 1¾ inches at 4,000,000 gallons per inch	7,000,000	
		226,894,900
Showing the amount of water furnished by the conduit south of Wellington Brook, Filter Basin, and Pond, in 274 days to be		660,003,500
Deduct amount received from Conduit south of Wellington Brook, 274 days @ 500,000 gallons per day, as ascertained by City Engineer	137,000,000	
Deduct amount received from the Filter Basin, 63 days @ 400,000 gallons per day, measured as above	25,200,000	
		162,200,000
And we have the amount of water furnished by the pond during the 274 days to be		497,803,500
We have found that the level of the pond was reduced during the year 3.75 feet, or 45 inches. Deduct now 45 inches @ 3,500,000 gallons per inch (the area of the pond being much reduced)		157,500,000
And we get at nearly the amount of water furnished by the pond from springs and ground flow, being the unseen sources of supply of water to the pond		340,303,500

This amount is equal to 1,241,984 gallons per day. We think this falling off in the pond supply is clearly accounted for by the falling off in the rainfall the past two years.

The foregoing calculations take in the supply for the whole year, and show the pond capacity for 274 days. Some have entertained the idea that as we lowered the pond level by pumping out of it, we should reach a point where the inflow would equal our wants, and the pond would go no lower. We wish now to present a statement which we think proves that so far as we have gone, exactly the contrary of this is true, and that the lower we pump the pond, the more the supply to the pond from unseen sources diminishes.

	Feet.
We find that on the last of November, the pond stood below high-water mark	8.33
On the last of August it stood at	6.79
Showing loss in the pond in three months to be or about 18½ inches.	1.54

		Gallons.
Whole amount of water pumped during the months of September, October, and November was		214,007,900
Deduct from this 30 days from Conduit south of Wellington Brook @ 500,000 gallons	15,000,000	
Also 61 days' supply from the Conduit including the Filter Basin @ 900,000 gallons	54,900,000	
Also deduct 18½ inches of water, being the loss in the pond level, @ 3,500,000 gallons	64,750,000	
		134,650,000
And we have as the amount furnished by the pond the last three months only		79,357,900

This is equal to 872,065 gallons daily, showing a significant falling off, which should command most careful consideration.

As early as June the low level of water in the pond, with the continued dry weather, caused serious apprehension on the part of the Board as to whether our supply would hold out until the expected fall rains came to reinforce it. There were but two ways open to us in case the pond should fall below the reach of our pumps. One way was to seek a temporary supply from Boston, and the other was to pump into our Conduit, and reduce our pond to a lower level than our main pumps would reach. It was decided to seek a connection with the Boston Water Works as the best thing for us to do, and our president obtained from the Boston authorities the permission to connect with their pipes at Brookline Bridge. No price was agreed upon, for we did not know that we should want any water from them. On their part they only agreed that they would give us a supply in case of necessity. On our part, we at first thought if the pond should fall below the reach of our pumps, that we could arrange with Boston for a partial supply until the fall rains came to our relief, cheaper than we could provide for pumping into the Conduit. But when September came and no rains of any account, a committee of this Board waited on the

Boston Water Board to see what terms we could make with them for water. We found that they were no better off in some respects than we were; that already they had commenced to pump into their Conduit at the Mystic Works, with the prospect that, unless rains should come before sixty days, they would have to do the same thing at Cochituate Lake. Under these circumstances we could not reasonably ask them to supply us until we had exhausted all our means to supply ourselves. This made it necessary to arrange to pump into our Conduit as soon as possible.

The necessary engine, boiler, and pump have been purchased and set up on the border of the pond, near the Conduit gate-house, and the same is now ready for use; none too soon, as the water is already out of reach of one of our main pumps, and if the pond continues to fall, it will soon be out of reach of the other pump. When we begin to pump into the Conduit, all our means of water supply for the city of Cambridge, with her more than fifty thousand inhabitants, would depend on one pump, if it had not been for the connection we made with the Boston Water Works. We think this connection one of the wisest and most prudent things ever done in connection with our water works, as it removes from us the fear of a water famine, and secures us against an exigency which we hope may never come; but if it should come, the use of this connection a single day would be worth more to the city of Cambridge than it all cost. We have treated this matter the more fully, because we hear there exists in the minds of some a doubt of the wisdom of making the connection, but this doubt we think will be removed when the facts are known and duly considered.

In looking around to see where any additional supply of water can be secured, we do not find any sufficient sources, except we go to the Shawsheen River, or make arrangements with the city of Boston. The first seemed to us, after examination, to be the best and surest supply. Our City Engineer, at our request, has examined the amount of water flowing at this extremely dry time, and made survey of the route, and estimates of the cost to bring the water into Fresh Pond; and on the strength of his report, we recommended your application the coming winter to the Legislature, for the right to take this water, and we understand that proper notice has been given by the Mayor that it is the purpose of the city to apply for this water.

We think if the Boston Water Board was so disposed, we could arrange with them to let us have the water to fill up our pond, at seasons of the year when they have large amounts running away over their dams, and during the night-time, when drawing from their main pipes would not interfere with their own citizens' supply by reducing their pressure.

We present this matter for your earnest consideration, believing that nothing concerning the welfare of our citizens and the future prosperity of our city is of so much importance now as the subject of securing an ample supply of pure water. We know the first cost may seem large, but we think in the future, as in the past, the water works, well managed, will pay their own way, without calling on the tax-payers.

As soon as it shall be found that the Legislature will grant us the right to increase our water supply by taking the water from Shawsheen River, we shall submit to you the plans of what we deem best to do.

For detailed statements of the condition of the water works in all its parts, we would refer you to the reports made to us by the registrar and superintendent, and herewith submitted as part of our report.

We cheerfully bear testimony to the faithfulness of the officers under our charge, and we believe that this department was never in so good condition as now. We also wish to acknowledge our obligations to the City Engineer and the City Solicitor for many services kindly rendered.

GEO. P. CARTER,
C. W. KINGSLEY,
H. L. EUSTIS,
J. WARREN MERRILL, } *Water Board.*
K. S. CHAFFEE,
JAS. M. W. HALL,
CHARLES WALKER,

Analysis of Water from Fresh, Spy, and Little Ponds, by Prof. E. S. Wood, during the season of 1880.

Figures express parts per 100,000 of water.

Number.	Date.	LOCALITY.	Filtered or Unfiltered.	Free Ammonia.	Albuminoid Ammonia.	Chlorine.	Total Residue.	Hardness.	REMARKS.
	May 15.	Fresh Pond (200 feet from Pumping Conduit).......	Filtered.	0.0058	0.0276	1.60	11.25	4½°	
	May 31.	Spy Pond (near outlet) ...	"	0.0132	0.0336	2.80	14.25	5½°	
	May 31.	Little Pond (gate-house)..	"	0.0026	0.0314	1.50	12.50	5°	
1	July 6.	Fresh Pond (near end of Pumping Conduit).......	"	0.0102	0.0290	2.00	16.00	5½°	
2	July 6.	Fresh Pond (mouth of Conduit at Black's Nook).	"	0.0052	0.0122	3.00	27.50	7½°	
3	July 6.	Fresh Pond (at Black's Nook)	"	0.0182	0.0195	3.20	23.50	7½°	
	July 21.	Fresh Pond (near end of Pumping Conduit).......	"	0.0056	0.0200	2.00	12.50	5½°	
	Aug. 23.	Fresh Pond (200 feet from Pumping Conduit).......	"	0.0146	0.0260	1.85	12.00	6°	
	Aug. 23.	Faucet on Chauncey St...	"	0.0026	0.0250	1.85	13.00	6°	
	Sept. 16.	Fresh Pond (at Black's Nook Conduit)...........	"	0.0029	0.0070	3.35	27.75	9°	No blackening of the residue when ignited therefore the volatile residue consisted of volatile mineral matter.
	Sept. 25.	Faucet on Chauncey St...	"	0.0021	0.0312	1.85	14.50	5½°	
	Oct. 6.	Spy Pond................	"	0.0374	0.0454	2.80	16.25	6½°	Very turbid, and contained much clathrocystis. Residue blackened considerably.
	Oct. 6	Little Pond	"	0.0134	0.0658	2.30	18.75	6°	Very turbid. Residue blackened considerably.
	Oct. 6.	Fresh Pond	Unfiltered.	0.0080	0.0270	1.75	14.00	6½°	Was quite clear and of good color.
	Oct. 7.	Spring on north side of Fresh Pond	Filtered.	0.0126	0.0108	1.75	27.00	10°	
	Oct. 9.	Faucet on Chauncey St, ..	"	0.0011	0.0218	2.00	15.60	7½°	
1	Nov. 8.	Fresh Pond (mouth of Conduit at Black's Nook).	"	0.0208	0.0134	2.50	21.70	11°	
2	Nov. 8.	Fresh Pond (200 feet from Pumping Conduit).......	"	0.0475	0.0226	1.90	15.90	6½°	
3	Nov. 8.	Faucet on Chauncey St...	"	0.0208	0.0124	1.70	14.00	6½°	
	Dec. 11.	Faucet on Chauncey St...	"	0.0171	0.0252	1.70	15.50	8°	
	Dec. 11.	Fresh Pond (200 feet from Pumping Conduit).......	"	0.0923	0.0226	2.00	15.80	8°	
	Dec. 11.	Spring on north side of Fresh Pond	"	0.0141	0.0116	4.20	27.70	12°	
	1881. Jan. 27.	Fresh Pond (at end of Pumping Conduit).......	"	0.0381	0.0404	1.60	11.30	7½°	
	Jan. 27.	Faucet on Chauncey St...	"	0.0101	0.0218	1.60	13.20	7½°	

REPORT

OF THE

WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, Dec. 8, 1880.

To the Cambridge Water Board:

THE undersigned herewith submits his Fifth Annual Report, showing the receipts, expenditures, and abatements for the year ending Nov. 30, 1880, together with a statement of the number of water-takers, fixtures, etc., and other matters in his department, as required by city ordinance.

Amount of bills remaining unpaid Nov. 30, 1879: —

Water rates	$1,763 66	
Meter rates	477 01	
Supplies and repairs	778 52	
		$3,019 19

Amount of bills placed in hands of City Treasurer for collection from Nov. 30, 1879, to Nov. 30, 1880: —

Water rates	$149,543 65	
Meter rates	28,488 15	
Supplies and repairs	3,599 78	
Off and on water, seals, and fines	879 47	
Rent of house at pipe yard	144 00	
		182,655 05
Total		$185,674 24

Deduct.	Abated.	Unpaid.	
Water rates	$4,954 62	$328 66	
Meter rates	157 54	92 53	
Supplies and repairs	11 26	604 52	
	$5,123 42	$1,025 71 =	6,149 13
Balance			$179,525 11

Receipts.

Water rates	$144,583 74	
Meter rates	28,286 45	
		$172,870 19
Water rates for previous year	$1,440 29	
Meter rates for previous year	428 64	
		1,868 93
		$174,739 12
Off and on water, seals, and fines	$879 47	
Rent of house at pipe yard	144 00	
		1,023,47
		$175,762 59
Supplies and repairs	$2,974 96	
Old iron	787 56	
		3,762 52
Total		$179,525 11
Amount reported by City Treasurer, as received by him		179,525 11

Expenditures.

Construction account		$25,234 04
Supply account		1,995 21
Maintenance account, viz.: —		
Care and repairs	$11,319 66	
Pumping service	9,639 35	
Office expenses	4,906 48	
		25,865 49
Total		$53,094 74

Abatements.

Abatements of water rates have been made during the year to the amount of	$5,112 16
Abatements on supply and repair account	11 26
Total	$5,123 42

(The above amount of abatements is caused by the necessary abatement of all charges upon fixtures sealed, or supplies shut off, whether per order of owners or for non-payment, before the books can be balanced. New charges are then made when the water is again let on.)

Refunds.

Water rates have been refunded for supplies shut off or fixtures sealed, to the amount of	$1,412 71
Add refund on warrant issued in 1879, paid in 1880	92
	$1,413 63

Water has been shut off for non-payment of rates, or per order of owners on account of vacancy, and seals have been applied by request of owners or occupants, as follows: —

Supplies shut off in 1880	402
Supplies let on in 1880	320
New supplies let on in 1880	137
Supplies let on, shut off in previous years	122
Seal-locks applied to fixtures in 1880	708
Seal-locks removed from fixtures in 1880	301
Seal-locks removed, put on in previous years	388

Water rates unpaid, Nov. 30, 1880	$140 33
City water rates unpaid, Nov. 30, 1880	188 33
Meter rates unpaid, Nov. 30, 1880	92 53
Supplies and repairs unpaid Nov. 30, 1880	604 52
Total	$1,025 71

Statement of the yearly revenue received from water rates since the purchase of the works by the city: —

From	April 28,	1865,	to	Dec. 1, 1865	$32,367 19
"	Dec. 1,	1865	"	1866	40,073 27
"	"	1866	"	1867	52,733 62
"	"	1867	"	1868	63,747 42
"	"	1868	"	1869	76,149 30
"	"	1869	"	1870	92,606 95
"	"	1870	"	1871	111,782 65
"	"	1871	"	1872	127,201 30
"	"	1872	"	1873	146,117 32
"	"	1873	"	1874	153,634 27
"	"	1874	"	1875	138,880 37
"	"	1875	"	1876	179,166 76
"	"	1876	"	1877	154,843 59
"	"	1877	"	1878	157,443 91
"	"	1878	"	1879	164,681 90
"	"	1879	"	1880	173,325 49

Comparative Statement.

	1879.		1880.	
Construction Account.				
Received	....	$4,424 56	....	$25,234 04
Expended	....	4,424 56	....	25,234 04
Supply Account.				
Received	....	$2,883 17	....	$3,762 52
Expended	....	1,534 20	....	1,995 21
Excess of receipts	....	$1,348 97		$1,767 31
Maintenance Account.				
RECEIVED.				
Water rates, less refunds	$164,681 90		$173,325 49	
Off and On water, seals and fines	982 65		879 47	
Rent	144 00		144 00	
On Account of Bond of A. F. Fifield	1,250 00			$174,348 96
EXPENDED.		$167,058 55		
Care and Repairs	$12,878 61		$11,319 66	
Coal ......$3,523 85 Pumping Service 4,192 56	7,716 41		9,639 35	
Office Expenses	5,398 06		4,906 48	
Interest on Water Debt	91,585 00		91,585 00	
Paid to Sinking Fund Commissioners,	45,855 00	163,433 08	45,855 00	163,305 49
Excess of Receipts		$3,625 47		$11,043 47
Supply Account, Excess of Receipts		$1,348 97		$1,767 31
Maintenance Account, Excess of Receipts		3,625 47		11,043 47
Excess of Total Receipts over Total Expenses		$4,974 44		$12,810 78

The excess of receipts over expenditures the past year, it will be seen, is $12,810.78. Following the precedent established in previous years, this large balance will be merged with other balances in the city treasury, without direct benefit to the water-takers.

Since I have held the position of water registrar, I have seen no reason why the unexpended balances of receipts from sales of water bonds should not be held to be drawn against for subsequent expenditures for construction account; in fact, held as "ways and means" of the water-works finances, as unexpended balances of cash in the treasurer's hands are of the city finances. If this had been the rule, the Water Board would not have needed to call attention, as it repeatedly has, to the difference existing between the actual cost of water works and the amount of water bonds issued.

After paying from the sinking fund $186,400, to redeem bonds to that amount, the difference between the unpaid cost of works and the amount of outstanding bonds was, in 1878, $29,555.16, or, deducting difference between premium and discount on bonds sold, $6,827.10; a net amount due water works of $22,728.06.

The Committee on Finance of the City Council for the year 1867 called attention to the then disagreement of these two items, which "it would seem well to make hereafter correspond"; but it has continued in varying amounts till the present time.

The balance due the water works, as reported last year, was	$18,303 50
The amount expended the past year is	25,234 04
Leaving amount of expenditures now in excess of amount of bonds	$6,930 54
From this, however, should be deducted interest at six per cent (as paid on bonds) while above amount has been accruing	3,386 87
Leaving balance due the city	$3,543 67

This balance could now be easily settled by itself, and the accounts hereafter so kept as to correspond, by carrying forward balances, as above suggested; but I wish to call attention to another and far greater discrepancy.

From a careful examination of the annual reports of the City Treasurer and Water Board, and also of the Water Works Sinking Fund accounts, I find that the total receipts on account of the water works (other than for "construction" or "extension"), from the purchase of the works, April 28, 1865, to Nov. 30, 1880, amount to $2,065,981.61, while the payments for same period amount only to $1,945,868.74.

In arriving at these totals, I have not presumed to decide what should or should not be charged or credited to the water works; I have taken the items as they stand upon the books, although it is well known that large amounts have been charged to the water-takers for improvements or work done, in which (so far as now apparent or aught that memory recalls) they could have had only a general interest.

The total receipts, as shown above, exceed the total expenditures $120,112.87, which amount has lapsed into the city treasury. To this should also be added interest at rate paid on water bonds (six per cent) while accruing to Nov. 30, 1880, amounting to $60,281.83, making a total of $180,394.70.

I see no question as to this amount's belonging in the sinking fund of the water works; and I respectfully suggest that the City Council be requested to cause the auditor of accounts, or some other person or committee, to examine these figures, to the end that this account may be adjusted, and the sinking fund (representing the water-takers) receive its just dues.

In this adjustment the balance due the city on construction account could be deducted, leaving balance due the water works $176,851.03.

If (as may be the case) the Act of the Legislature for 1875 so far repeals the provisions of the Act of 1865 as to allow the city to claim and use for other purposes all surplus receipts of the water works, over and above the three per cent to be paid into the sinking fund, although such payment of three per cent may seldom, if ever, call for one dollar from the city treasury, while the surplus will possibly largely benefit the general tax-payers at the expense of the water-takers, then the above figures will be changed to read as follows: —

Excess of receipts over expenditures	$92,771 14
Add balance of interest on same	58,802 61
Total	$151,573 75
Deduct excess of expenditures on construction account . .	3,543 67
Balance due sinking fund	$148,030 08

(As will be seen, the amount of $27,341.73 has already lapsed into the city treasury since the passage of said Act in 1875, exclusive of interest on same while accruing.)

This amount, if transferred, will materially help the sinking fund, which, by the change of date of payment of the annual three per cent from June 30 to Nov. 30, in the late revision of the city ordinances, is caused to lose annually five months' interest on amount payable to it, which could be fairly offset, perhaps, by an additional payment of five twelfths of the annual payment for this year.

An examination of the sinking-fund account will also show that the allowance of interest on balances in Treasurer's hands has been discontinued, although the city still has the benefit of large amounts received in July, and not paid out on account of the water works for some months afterward, thereby saving interest on otherwise necessary temporary loans.

I wish also to emphasize what I have previously personally called your attention to, viz., the repeatedly expressed desire of many water-takers that water rates may be made payable at an earlier date than July; and although one branch of the City Council has negatived your recent request for such change, I feel that the grounds for such request are tenable, and that the reasons for it were misunderstood, as the granting of it will relieve many of the water-takers from present inconvenience, and will in nowise increase their amounts payable.

The month of July brings to business men generally increased expenditures, with lessened receipts, while many are endeavoring to enjoy the annual breathing spell. The month of August brings a notice (not required by city ordinance) of an overdue and overlooked water bill, necessitating a trip to Cambridge, or a draft from some distant point, to secure immunity from the penalty made imperative by city ordinance.

With the poorer classes the same season is necessarily improved in preparation for the October tax bill. The present arrangement is productive of much complaint, which is by no means restricted to those by whom it is more forcibly than elegantly expressed. If, as suggested, water bills for next July are made for nine months only, and afterwards annually in April, coming equidistant from " tax time," a proposed return to the present arrangement would meet with opposition from all classes of citizens.

During the year all premises in the city where Fresh Pond water is used have been visited, and the office list of fixtures changed in accordance with the report of the inspectors. The increase of receipts is due to the thoroughness of this inspection, as well as to additional supplies, and a less number of seals applied on account of increased occupancy, while the large increase of meter rates shows unusual activity in manufacturing establishments.

One hundred and forty-seven new supplies have been laid during the year, eight of which are for houses formerly supplied by extensions from other houses, generally upon other streets. Eleven of the new supplies have not yet been paid for nor let on.

One hundred and fifty-six meters are now in use, an increase of twenty over last year. Twenty-nine have been placed in various locations during the year, and nine removed.

Besides the manufactories, etc., supplied by meter, water is now supplied to 10,537 families, 766 stables, with 1,865 horses and 260 cows, 202 shops, 277 stores and offices, by the following fixtures, viz.: —

12,831 faucets.
3,486 wash-basins.
1,999 wash-tubs.
1,872 bath-tubs.
4.370 pan closets.
694 slop closets.
12 hopper closets.
60 urinals.
68 yard hydrants
5 fountains.
1,001 hand hose.
3 tumbler-washers.

Also,—

579 fire-hydrants (including 4 on private premises).
14 fire-reservoirs.
16 drinking fountains in public squares.

The above is exclusive of the school-houses, engine-houses, police stations, and other city buildings, for which special rates are charged, except where meters are located.

Respectfully submitted,

J. WARREN COTTON,
Water Registrar.

REPORT

OF THE

COMMITTEE ON ACCOUNTS OF THE CAMBRIDGE WATER BOARD.

We have examined the abstract of the books of the Water Registrar as prepared by him, and the statements of the City Treasurer and Auditor of Accounts, all of which are herewith submitted for record on the books of this Board, and we find them to agree.

The amount of bills in the hands of the Treasurer uncollected Nov. 30, 1879, was: —

For water rates	$1,763 66	
" meter rates	477 01	
" supplies and repairs	778 52	
		$3,019 19

The amount of bills placed in his hands for collection by the Water Registrar during the year ending Nov. 30, 1880, was: —

For water rates	$149,543 65	
" meter rates	28,488 15	
" supplies and repairs	3,599 78	
" turning off and on, seals, and fines	879 47	
" rent of house at pipe yard	144 00	
		182,655 05
Of this amount the Treasurer has collected	$179,525 11	
There have been abated	5,123 42	
And there are in his hands uncollected	1,025 71	
	$185,674 24	$185,674 24

There have been refunded	$1,412 71
Which amount, deducted from the total receipts by Treasurer ($179,525.11), leaves net receipts	$178,112 40

The committee calls attention to the fact that the Water Registrar has no vouchers from the City Treasurer for bills sent to that department for collection. It is very creditable to the Water Registrar, that in making up his accounts without reference to the Auditor's or Treasurer's departments, the amounts tally exactly.

We suggest that hereafter vouchers should be furnished the Registrar for all bills turned over to the City Treasurer by him.

J. WARREN MERRILL, JAMES M. W. HALL, CHARLES WALKER,	*Committee* *on* *Accounts.*

REPORT

OF THE

SUPERINTENDENT OF THE WATER WORKS.

To the President and Members of the Cambridge Water Board:

GENTLEMEN, — The Annual Report of your superintendent, upon the condition of the works and the operations of the past year, is herein presented.

Total number of gallons of water pumped, 886,890,400 gallons.

Coal consumed per million gallons pumped, 1,825.30 pounds.

Water sold by meter and that used for watering streets, 170,471,250 gallons; leaving 716,419,150 gallons for domestic use.

Number of gallons for each inhabitant on whole amount pumped, 46¾ gallons.

Number of gallons for each inhabitant on amount for domestic use, 37¾ gallons.

Spy and Little Ponds, Wellington Brook, and Conduit.

The pipe connection between Spy and Little Ponds has not been used during the year. Its gates are in good condition. Spy Pond, during the past year, has contained large amounts of the weed known as clathrocystis; and as the result of several chemical analyses, its water has been deemed unfit for domestic use.

The Filter Basin is in good condition, and water has been drawn from it since the 28th of September.

Inspections of Wellington Brook and its branches have been made, and they were found in their usual condition. The weeds have been removed and the brook cleaned out from the gate-house to the branch in Frost's meadows, where a temporary gate has been set, by permission of the land-owner, to turn the water from Little Pond to the Conduit. Water has been drawn from this source at all available opportunities during the months of February, March, and April.

Inspection has been made of the Conduit interior, from Wellington Brook to Fresh Pond. It was found clean and, except at Black's Nook gate-house, where a slight settling is apparent, in perfect repair.

Fresh Pond.

The exceedingly low stage of the water has permitted the removal of great quantities of weeds. Three nooks also have been cleaned out and greatly improved; one on the north side of the pond between the Tudor ice-houses, one on the south side opposite the hotel grounds, and one, called Boathouse Nook, on the east side. There yet remain three others that should be cut off from the pond, as contemplated at one time during the past summer.

Apprehensions for the future have also compelled the providing an auxiliary pump at the pond. A pump-house has been built near the draught conduit and the gate-house, with a flume 54 feet in length and 5 feet wide, reaching deep water. A 35 horse-power portable engine and a twelve-inch "Heald & Siscoe" pump, with abundant capacity to supply the engines at the pumping works, have been placed for the purpose, if needed, of pumping from the pond into the Conduit. By this arrangement, water can be drawn from a depth as low as grade 1.00, or four feet below the inside bottom of Conduit.

The elbow and one length of the draught-conduit pipe, that had become detached and fallen into the pond, have been raised and placed in proper position. New girders and braces have been bolted to the piling, and girders and stringers have been fastened on the top of the trestle-work, binding the whole structure together and securing additional strength against the action of the ice.

Nothing has been done on the engine-house lot and Tudor

Park other than the general care of their walks and trees, and cutting the grass.

The wall between the boiler-room and coal-shed, that was damaged while getting in the coal last year, has been rebuilt, the Fitchburg Railroad Company paying one half the expense.

The engineer's report appended shows the condition of the engines and boilers.

A six-inch drain has been laid in Fresh Pond Lane, from Peat Pond on the easterly side of the lane to the railroad location, where it empties into a an open ditch and the water is carried to the sewer near the engine-house. This pond formerly emptied into Fresh Pond, but the water being very objectionable, it was cut off about two years ago; having no outlet, the above drain became a·necessity.

Reservoirs.

Nothing has been done other than the usual care of walks and cutting the grass, except slight repairs of valve. No leakage has appeared since the repairs were made the preceding year, except at the foundation, where it is very slight, and no more than at completion of repairs. About thirty feet of retaining wall on the west side near the north corner, I think should be taken down and rebuilt.

The chronograph is in perfect working order, and is constantly recording the fluctuation of the water in the reservoir.

Distribution Pipes.

The most important extension has been the connection with Boston by the sixteen-inch line through Putnam Avenue from Pleasant to Brookline Street, thence through Brookline Street and across Brookline Bridge (the pipe across the river being enclosed on a pipe bridge with an inverted siphon at the draw) to Brighton Avenue, where a connection was made with the sixteen-inch main in Boston.

A six-inch connection of the lines on Portland Street and Potter Street through Binney and Ninth Streets has been made.

The old four-inch line on the west side of Mt. Auburn

Street, between Ash and Hilliard Streets, has been abandoned; Brewer and Gerry Streets, which were formerly connected on this main, being now connected with the new six-inch main on the east side of Mt. Auburn Street.

Forty-four feet of four-inch pipe have been taken up on Potter Street, westerly from Third Street, and a six-inch pipe substituted.

New Supplies.

One hundred and thirty-nine new supplies have been laid this season, which, added to the number reported last year, makes the present total 7,322. Thirty-nine old supplies have been renewed, and 101 sidewalk shut-offs have been put on to old supplies. A total number of 195 leaks have been stopped. Of these, 38 were on three-inch pipe and upwards, 51 on supplies in street, and 106 on premises, reported by the inspector, and repaired by the owner or occupant. During the year 94 new gate boxes have been set in place of decayed ones, 16 new hydrant boxes and 8 new meter boxes. Twenty new gates and blow-offs have been set.

Hydrants, Meters, Fountains, and Standpipes.

One new post hydrant, "Pattee & Perkins," has been set in a new location, and two hydrants have been put in to replace broken ones; viz., one in college grounds, broken by firemen, and one corner of Dunster and South Streets, broken by W. T. Richardson & Co.'s coal team. One flush hydrant has been discontinued, making number of hydrants now in use 579, of which 240 are post and 339 flush hydrants. Three new garden hydrants have been set, making the total number in use 110

Twenty-nine new meters have been set and 9 discontinued. The present total is 156.

The number of drinking fountains remains the same as at date of my last report. All are in good repair.

One new standpipe for street-watering has been set on Prison Point Street, one discontinued on Fifth Street, and one changed to new location; viz., from North Avenue at Forest Street to North Avenue near Roseland Street.

Pipe Yard.

The buildings are in good repair except that the house, which stands on posts, has settled somewhat. I recommend that a stone and brick foundation be put in it the coming year.

Accompanying this report is that of the engineer at the pumping works, and tables showing the monthly amount and daily average of water pumped, the Fresh Pond record of water height, the locations of meters, fountains, and standpipes, the details of main and supply extensions, and the account of stock on hand.

All of which is respectfully submitted,

HIRAM NEVONS, *Superintendent.*

List of Meters in Use Nov. 30, 1880.

METERS.	Locality.	Size.	Description.
		Inches.	
American Net and Twine Co.	Third St.	1½	Worthington.
American Steam Safe Co.	Main St.	1	"
Bay State Glass Co.	Bridge St.	1	Union Rotary.
Bird, H. M. (Iron Foundry)	Broadway	⅝	"
Boston Bolt and Nut Co.	Portland St.	⅝	Désper.
Boston Woven Hose Co.	Portland St.	⅝	Worthington.
Boston Stamping Co. (Tin Ware M'f'y)	Third St.	2	"
Boston Chemical Works	Third St.	¾	"
Boston & Albany R R. (Tank for filling Locomotives)	Waverly St.	1½	"
Boston & Lowell R. R. (Repair Shop)	Bridge St.	2	"
Boston & Lowell R. R. (Roundhouse)	Prison Point St.	2	"
Boston & Lowell R. R. (New Roundhouse)	Prison Point St.	2	Crown.
Boston & Lowell R. R. (Paint Shop)	Prison Point St.	1	"
Boston & Lowell R. R. (Filling Locomotives)	Prison Point St.	6	Union Rotary.
Broomhead, M. (Coffee Grinding)	Columbia St.	1	Worthington.
Bullock, O. S. (Machine Shop)	Broadway	1	"
Carr Bros. (Soap Factory)	Lopez St.	1	"
Capen, Sprague & Co. (Oil Works)	Sixth St.	¾	Désper.
Cambridgeport Diary Co.	Magazine St.	1	Worthington.
Cambridge Gas Light Co.	Third St.	2	"
Campbell Bros. (Boiler Factory)	Osborn St.	⅝	Désper.
City of Cambridge (Shepard School-house)	North Ave.	2	Worthington.
City of Cambridge (Ward 1 Building)	Brattle Sq.	2	"
City of Cambridge (Ward 4 Building)	Central Sq.	1½	"
City of Cambridge (Cambridge Cemetery)	Coolidge Ave.	4	"
City of Cambridge (Almshouse)	Tannery St.	2	"
City of Cambridge (In Yard, Stable)	Hampshire St.	¾	Désper.
City of Cambridge (In Yard, Engine house)	Hampshire St.	⅝	"
Close, Geo. (Confectionery)	Broadway	1	Worthington.
Clark, B. P. & Co. (Confectionery)	Main St.	1½	"
Cochran, A. & Co. (Ammonia Factory)	Potter St.	¾	"
Coleman, John & Sons (Coal Wharf)	Broadway	1	"
Cooper's Car Wheel Co.	Hampshire St.	¾	"
Cofran, S. M. (Brick Yard)	Concord Ave.	1½	"
Coolidge, J. G. (Floral Conservatory)	Coolidge Ave.	1	"
Davis, Curtis & Co. (Soap Factory)	Broadway	1½	"
Davis, J. C. & Son (Soap Factory)	Broadway	1	"
Davis, Mason (Soap Factory)	Lincoln St.	⅝	"
Dailey, Charles W. (Livery Stable)	Cambridge St.	1	"
Downing, Theo. (Tannery)	Eustis Ct.	1	"
Draper, F. & Co. (Brass Works)	Otis St.	¾	"
Eagle Rubber Co.	Potter St.	2	"
East Cambridge Club Stable	First St.	1	"

List of Meters in Use Nov. 30, 1880. — *Continued.*

METERS.	Locality.	Size.	Description.
		Inches.	
Ela Bros. (Ivory Turning)	Broadway	1	Worthington.
Episcopal Theological Seminary, Church	Brattle St.	2	"
Episcopal Theological Seminary, Dormitory	Brattle St.	1½	"
Fenton, N. & Co. (Mattress Factory)	Gore St.	¾	Désper.
French, C. A. (Hotel)	Farwell Place	1	Worthington.
Geldowsky, F. (Furniture Manufactory)	Otis St.	1	"
Gilmore & Eustis (Cambridge Rolling Mill)	Portland St.	2	"
Goepper Bros. (Barrel Factory)	Ninth St.	2	"
Greene, A. T. & Co. (Manuf. of Artists' Colors),	State St.	⅝	Union Rotary.
Greely, Leander (Planing Mill)	Broadway	1½	Worthington.
Griffin & Dolan (Soap Factory)	Decatur St.	¾	"
Harvard College (Boylston Hall)		1	"
Harvard College (Holworthy Hall)		¾	"
Harvard College (Stoughton Hall)		⅝	"
Harvard College (Seaver Hall)		⅝	"
Harvard College (Thayer Hall)		1½	"
Harvard College (In Yard)		1½	"
Harvard College (Memorial Hall)	Cambridge St.	2	"
Harvard College (Boat-House)	Flagg St.	¾	Ball & Fitts.
Harvard College (Botanical Garden)	Garden St.	1	Worthington.
Harvard College (Gymnasium)	Cambridge St.	1½	"
Harvard College (Holyoke House)	Harvard St.	2	"
Harvard College (Museum Comp. Zoöl.)	Divinity Ave.	1	"
Harvard College (Scientific School)	Kirkland St.	⅝	Désper.
Hazlett, W. H. & Co. (Planing Mill)	Otis St.	1½	Worthington.
Hale, Teele & Bisbee (Soap Factory)	Davis St.	¾	Désper.
Hews, A. H. & Co. (Pottery)	Crescent Ave.	1	Worthington.
Hixon, Edward & Co. (Furniture Manufactory),	Harvard St.	¾	"
Holmes, F. M., Manuf Co (Furniture)	Cambridge St.	2	"
Houghton, H. O. & Co. (Publishers)	Blackstone St.	2	"
Hovey & Co., North Side (Floral Conservatory),	Cambridge St.	1	"
Hovey & Co, South Side (Floral Conservatory),	Cambridge St.	1	"
Jaynes & Co. (Barrel Factory)	Pacific St.	⅝	Ball & Fitts.
Jones, C. L. & Co. (Soap Factory)	Pearl St.	¾	Worthington.
Kemp, L. & Son (Soap Factory)	Davis St.	1	Ball & Fitts.
Kennedy, F. A. (Cracker Bakery)	Green St.	1	Désper.
Kendall & Roberts (Iron Works)	Main St.	¾	Worthington.
Low, J. W. (Tannery)	Reed St.	1½	"
Loan, J. J. (Soap Factory)	Columbia St.	⅝	Désper.
Little, Brown & Co. (Book Bindery)	Blackstone St.	⅝	Worthington.
Lincoln & Chamberlain (Slaughter House)	Distillhouse St.	¾	"
Mason & Hamlin Organ Co.	Broadway	1	"
Middlesex Bleachery (Dye Works)	Sacramento St.	¾	"
Middlesex County (House of Correction)	Thorndike St.	2	"
Middlesex County (Court House)	Thorndike St	⅝	Ball & Fitts.
Middlesex County (Court House)	Otis St.	⅝	"
Middlesex County (Registry of Deeds)	Otis St.	¾	Worthington.
Millan, Alexander (Fish Market)	Brattle St.	⅝	Désper.
Möring, Mrs. A. L. (Beck Hall)	Main St.	1	Worthington.
Mount Aubnrn Corp. (Floral Conservatory)	Brattle St.	1	"
Mount Auburn Corp. (Cemetery)	Mt. Auburn St.	⅝	Désper.
Murdock, Walter H. (Floral Conservatory)	Grigg St.	⅝	"
New England Glass Co.	North St.	2	Worthington.
Norton, E. H. (Soap Factory)	Winsor St.	⅝	"
O'Brien, John (Slaughter House)	Beech Ave.	1	"
Page, Geo. G. & Co. (Box Factory)	Hampshire St.	2	"
Parry Bros. & Co. (Brick Yard)	Raymond St.	⅝	"
Pike, James & Co. (Livery Stable)	Church St.	1	"
Pike, James & Co. (Livery Stable)	Farwell Place	⅝	"
Porcellian Club (Harvard Students)	Harvard St.	⅝	Désper.
Porter's Hotel (Frank Locke)	North Ave.	⅝	"
Prospect House (Joseph Uhrig)	Main St.	1½	Worthington.
Ross House (Mrs. H. P. Ross)	Broadway	⅝	"
Reardon, John & Sons (Oleomargarine Factory)	Talbot St.	4	"
Reardon, William (Soap Factory)	Portland St.	⅝	Désper.
Revere Sugar Refinery (South Side)	Water St.	8	Worthington.
Revere Sugar Refinery (North Side)	Water St.	3	Union Rotary.
Reversible Collar Co	Mt. Auburn St.	1	Worthington.
Rhoades, Silas & Son (Planing Mill)	State St	2	"
Rideout, M. E. & D. T. (Planing Mill)	Banks St.	¾	"
Roberts, O. P.	Brattle St.	1	"
Rogers, Geo. M.	Washington St.	3	"

List of Meters in Use Nov. 30, 1880. — *Concluded.*

METERS.	Locality.	Size.	Description.
		Inches.	
Russ Moulding Co.	Thorndike St.	1	Désper.
Sands, John L., Estate of (Brick Yard)	Walden St.	⅝	Worthington.
Sanborn, G. P. & Son (Pickling Factory)	Gore St.	¾	Désper.
Shorey, George L. (Laundry)	Soden St.	1½	Worthington.
Shaw & Applin (Furniture Manufactory)	Bridge St.	1½	"
Smart, D. C. (Wood Turning)	Main St.	⅝	Désper.
Sortwell & Co. (Distillery)	Distillhouse St.	2	Worthington.
Squire, John P. & Co. (Slaughter House)	Gore St.	2	"
Squire, John P. & Co. (Slaughter House)	Gore St.	2	"
Squire, John P. & Co. (Stable)	Gore St.	1	"
St. Mary's Church	Norfolk St.	2	"
Stiles, John C. (Omnibus Stable)	Cambridge St.	2	"
Stiles, John C.	Inman Square	⅝	Désper.
Thayer, Henry & Co. (Laboratory)	Broadway	2	Worthington.
Tower, Sylvester (Piano Key Manufactory)	Broadway	1	"
Tug "Henry Chapel" (Steamboat)	First St.	2	"
Tribune Publishing Co.	Linden St.	⅝	Désper.
Union Railway Co. (Washing Cars)	Dunster St.	⅝	Worthington.
Union Railway Co. (Repair Shop)	Dunster St.	¾	"
Union Railway Co. (New Car House)	Dunster St.	⅝	"
Union Railway Co. (Wooden Stable)	Dunster St.	⅝	"
Union Railway Co. (Brick Stable)	Dunster St.	1½	"
Union Railway Co. (North Side)	Cambridge St.	1	"
Union Railway Co. (South Side)	Cambridge St.	1	"
Union Railway Co.	Baldwin St.	1	"
Union Railway Co.	Mt. Auburn St.	1	"
Union Railway Co.	Main St.	¾	Désper.
Union Railway Co.	North Ave.	2	Worthington.
Union Railway Co.	Cambridge, cor. Baldwin St.	1	"
Union Railway Co.	River St.	1	"
Union Glass Co. (Packing Room)	Webster Ave.	⅝	Ball & Fitts.
Union Glass Co. (Pot Room)	Webster Ave.	1	Worthington.
Warren, J. H. (Felton Hall)	Cambridge St.	1½	"
Walworth Manufacturing Co	Main St.	1½	"
Wellington, J. A. & Co. (Coal Wharf)	Winter St.	¾	"
Wilson, John & Son (Publishers)	Brattle Square	1	"
Woodbridge, S. F. (East Slaughter House)	Frank St.	1	"
Woodbridge, S. F. (West Slaughter House)	Frank St.	⅝	"
Woods, Geo. & Co. (Organ Factory)	Main St.	2	"
Wight & Scorgie (Marble Polishing)	Mt. Auburn St.	¾	"
Wyatt, H. M. (Brick Yard)	Dublin St.	¾	"

List of Drinking Fountains, Nov. 30, 1880.

Bridge Street, junction of Cambridge Street.
Broadway, southwest corner of Norfolk Street.
Brattle Square, east side of Brewer's Block.
Brattle Street, junction of Fresh Pond Lane.
Cambridge, south corner of Fifth Street.
Central Square, west side.
Central Square, east side.
Fort Washington.
Hampshire Street, junction of Broadway.
Harvard Square, at the flag-staff.
Inman Square, east side.
Main Street, junction of Front Street.

Main Street, junction of Mt. Auburn Street.
North Avenue, southwest corner of Walden Street.
North Avenue, north side, west of Cameron Street.
Putnam Avenue, southwest corner of Pearl Street.
Third Street, west side, north of Main Street.

List of Standpipes (for Street-watering), Nov. 30, 1880.

Brattle Street, near University Press.
Brattle Street, corner of Sparks Street.
Brattle Street, near Fayerweather Street.
Brattle Street, near Fresh Pond Lane.
Bridge Street, junction of Cambridge Street.
Broadway, near Third Street.
Broadway, corner of Sixth Street.
Broadway, corner of Winsor Street.
Broadway, junction of Hampshire Street.
Brookline Street, corner of Putnam Avenue.
Cambridge, near Warren Street.
Cambridge, near Winsor Street.
Cambridge, at Inman Square.
Columbia, near Austin Street.
Concord Avenue, at junction of Garden Street.
Dana, at corner of Chatham Street.
Dublin, near Fitchburg Railroad.
Gore, west of Third Street.
Green, near Western Avenue.
Harvard, corner of Prescott Street.
Inman, near Broadway.
Kirkland, near Quincy Street.
Main, near Portland Street.
Main, near Hancock Street.
Magazine, opposite Warland Street.
Mount Auburn, near Athens Street.
North Avenue, near Common.
North Avenue, corner of Sacramento Street.
North Avenue, near Roseland Street.
North Avenue, near Beech Street.
North Avenue, near Spruce Street.
North Avenue, corner of Norris Street.

North Avenue, opposite Tannery Street.
Prison Point Street, opposite Roundhouse.
Third Street, near Rogers Street.
Thorndike, near Third Street.
Western Avenue, near Howard Street.

New Main Pipe laid for Extensions and Renewals, from Dec. 1, 1879, to Nov. 30, 1880, inclusive, with the Number of Gates and Fire Hydrants used.

LOCATION.	Iron Pipe.		Gates.		Fire Hydrants.	
	Size.	Length.	No.	Size.	No.	Size.
	Inch.	Feet.		Inch.		Inch.
Watson and Pearl Streets	..	.....	1	4		
Groveland Street, south from Spruce	¾	253				
Winsor Street, south side of Hampshire	..	.....	1	4		
Market Street, west side of Winsor	..	.....	1	4		
Lambert Avenue, west from Walnut Avenue	6	60				
Washington Ave., north side Arlington Street	..	.....	1	6		
Binney Street, Portland to Ninth	6	873				
Ninth Street, Binney to Potter	10	43				
Ninth Street, Binney to Potter	8	187				
Portland and Binney Streets	..	.....	1	6		
Ninth and Binney Streets	..	.....	1	8	1	6
Harrison Street, south from Washington	6	100				
Third and Potter Streets, 4″ discontinued, 6″ substituted	6	44	1	6		
Tufts Street, north from Pearl	4	90	1	4		
Pearl Street, west from Tufts	4	456				
Brewer Street	1½	92				
Daye Court, to supply H. O. Houghton's houses.	1½	180				
Brooks Street, south from School	4	206				
Court Street, off Putnam Avenue	¾	71				
Kirkland and Oxford Streets	..	.....	1	4		
Chestnut Street, south from Pearl Street	4	211				
Follen Street, near Waterhouse	4	16				
Spring Street, between Sixth and Ninth	4	147				
Webster Avenue, to Glass House supply	..	.....	1	4		
Putnam Avenue, Pleasant to Brookline	16	1,631				
Brookline Street, Putnam Avenue to the bridge,	16	1,666				
Across the bridge and siphon	16	790				
Essex Street, Boston, bridge to Brighton Ave.	16	329				
Pleasant Street and Putnam Avenue	..	.....	1	16		
Magazine Street and Putnam Avenue	..	.....	1	6		
Pearl Street and Putnam Avenue	..	.....	2	4		
Brookline Street and Putnam Avenue	..	.....	1 1	16 6		
Brookline and Chestnut Streets	..	.....	1	4		
East end of bridge	..	.....	1 2	16 4		
Essex Street and Brighton Avenue, Boston	..	.....	1	16		
Essex Street, Boston, at west end of bridge	..	.....	1	4		

Recapitulation.

	16 in.	10 in.	8 in.	6 in.	4 in.	1½ in.	¾ in.	Totals.
Length of iron pipe in feet,	4,416	43	187	1,077	1,126	272	324	7,445
Number of gates	4	...	1	5	10	...	...	20
Hydrants	....	...	..	1	....	...	...	1

Statement of Stock on Hand, Dec. 1, 1880.

FOR STREET MAINS (IRON PIPE AND FITTINGS).

NUMBER OF—	48 in.	30 in.	24 in.	20 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Straight pipes (12 feet each........	2	25	..	17	16	24	98	4	219	58	1
Elbows...........	..	..	..	..	2	..	2	..	..	2	
Bends (1-36″).....	..	..	2	2	..	..	4	..	14		
Y branches.........	..	..	1	..	..	1					
Sleeves	..	2	4	8	2	2	6	1	6	7	12
Clamp sleeves.....	..	..	3	2	..	4	4	5	3	9	3
Drain offsets......	..	..	..	..	..	..	..	..	25		
Offsets............	..	..	..	..	..	..	6	..	12		
Gates............	..	..	..	..	..	8	1	..	1	2	
Check-valves (old),	..	..	2								
Blow-offs	..	..	..	2-6″							
Caps	..	..	2	..	2	7	5	8	4	8	
Plugs	..	..	..	..	..	1	1	2	1		
Crosses	..	..	..	2-10″	1-12″	4-3″	7-6″	..	10-4″		
	..	..	..	1-20″	3-6″	1-4″	2-8″	1-8″	5-6″	17-4″	
	..	..	..	..	..	6-6″	2-10″				
	..	..	..	..	..	5-10″					
Reducers	..	..	1-10″	2-12″	1-6″	2-10″	4-6″	3-6″	2-4″	6-3″	
	..	..	1-8″	1-8″	..	1-6″	4-8″				
T's.............	..	..	3-6″	2-12″	1-6″	..	19-6″	12-6″	16-6″		
	..	..	1-8″	3-20″	..	4-6″	..	..	..	10-4″	1-3″
	..	..	1-24″	2-6″	..	1-4″	..	1-4″			

FOR SUPPLIES (GALVANIZED PIPE AND BRASS FITTINGS).

	2½ in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
Length of galvanized pipe.........	16	228	35	310	180	500	28
Elbows	2	7	88	60	30	12	45
Street elbows	..	...	...	...	9	21	
Couplings.........................	2	115	6	12	198	20	85
Unions for lead pipe	..	...	...	...	...	6	
Unions............................	..	14	12	25	6	15	
Stop and waste cocks..............	..	1	2	2	12	36	
Screw-cocks	..	...	1	8	7	22	
Corporation cocks.................	..	...	5	...	58	1	
Screw-cocks for cement pipes							
Sidewalk cocks....................	..	...	...	...	30	2	
Blow-off cocks	..	...	8				
Hydrant cocks							
Sill-cocks							
Hose-bibbs........................	..	...	...	...	13	2	3
Air-chambers	..	...	...	...	45	15	55
Socket-ends	..	...	...	...	6	100	
Lock-nuts.........................	..	...	...	...	36	38	
Nipples	2	35	30	70	15	30	100
Hose nipples	..	...	...	...	...	5	
Plugs	..	2	3	5	20	3	
Bushings..........................	..	...	...	...	12-¾″	6-½″	
Clips.............................	..	12-1¼	20-1¼″	12-1″	...	12	
T's, malleable	..	...	...	2	3	117	55
T's, cast-iron	..	300	130	120	130	450	50
Crosses, cast-iron	..	80	124	95	95	40	
Reducing couplings	..	...	...	...	...	100	
Caps	..	...	...	...	...	...	10

New Supplies.

GALVANIZED PIPE AND BRASS FITTINGS USED FROM DEC. 1, 1879, TO NOV. 30, 1880, INCLUSIVE.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.	Total.
Length of galvanized pipe..........	126	14	36	388	5,555	..	6,119
Number of supplies..................	2	1	..	6	130	..	139
Number of stop and wastes	2	1	..	5	125	..	133
Number of screw cocks	1	..	..	8	107	..	116
Number of sidewalk cocks	...	..	..	6	131	..	137
Number of faucets..................	...	..	..	...	....	7	7
Number of standpipes...............	...	..	..	...	....	..	135

Stock in Shop and at the Yard.

2 horses.
4 wagons.
3 harnesses.
1 double-runner sled.
1 pung.
4 blankets.
2 oil-covers for horses.
1 hay-cutter.
1 large boom derrick.
1 breast derrick.
3 small derricks.
1 lathe, with the usual chucks and tools.
1 platform scale.
1 water motor.
1 pipe-threading machine with dies from ½″ to 2″.
4 plates from ½″ to 1″.
1 set of pipe-taps from ½″ to 2″.
1 drilling machine.
1 large hand pump.
8 thawing pumps.
2 hydrant wrenches.
9 pipe wrenches.
3 monkey wrenches.
3 2″ cock wrenches.
2 1″ cock wrenches.
9 sidewalk cock wrenches.
12 gate wrenches.
4 blow-off wrenches.
8 pairs of tongs.
7 pipe cutters.
4 tool chests.
18 lanterns.
2 bench vises.
6 rammers.
25 picks.
24 shovels.
4 chains.
2 hand carts.
3 lead-kettles and furnaces.
7 pails.
266 seals.
1,550 pounds of lead.
1 post hydrant.
4 garden hydrants.
25 old flush hydrants.
2 drinking fountains.
2 hydrant boxes.
4 small gate boxes.
4 large gate boxes.

2 meter boxes.
50 risers for gate boxes.
2 2″ meters.
3 2″ counter and ratchet movements.
2 1½″ counter and ratchet movements.
1 1″ counter and ratchet movements.
1 ¾″ meter.
2 ″ meters.
2 ⅝″ counter and ratchet movements.
6 2″ meter dials.
2 1½″ meter dials.
3 1″ meter dials.
6 ⅝″ meter dials.

REPORT

OF THE

ENGINEER AT THE PUMPING STATION.

PUMPING STATION, CAMBRIDGE WATER WORKS
CAMBRIDGE, Dec. 1, 1880.

Hiram Nevons, Esq., Supt. Cambridge Water Works:

SIR, — I would report that the engines and boilers are in good condition. During the past year No. 1 engine has been fitted with new air pump covers and trunk connections, the expense of which was $275. The work was done by Kendall & Roberts of this city, and was thoroughly satisfactory in every particular. Following will be found a statement of the expenses at the pumping station, together with the engine record, pond levels, and rainfall for the past year; also a list of stock and tools on hand.

E. C. BROOKS, *Engineer.*

Statement.

$722\frac{1520}{2240}$ tons Cumberland coal, @ $5.74	$4,148 18
Oil, waste, packing, etc.	257 17
Salaries	3,341 25
Repairs on engines and boilers	285 75
Tools	12 04
Repairs on buildings and care of grounds	696 69
Total	$8,741 08

Engine Record, Pond Level, and Rainfall.

DATE.	Total Running Time.		Daily Average Running Time.		Total Coal consumed.	Daily Av. Coal consumed.	Total Water pumped.	Daily Average Water pumped.	Average Height of Pond.	Rainfall.
	hours.	min.	hours.	min.	pounds.	pounds.	gallons.	gallons.		
December, 1879	318	20	10	16	146,500	4,726	68,959,200	2,224,490	11.98	3.76
January, 1880	309	55	10	0	142,500	4,597	68,422,500	2,207,177	11.98	2.62
February, "	302	25	10	26	129,900	4,479	67,446,000	2,325,724	12.25	3.49
March, "	310	15	10	0	135,400	4,368	67,757,400	2,185,722	12.71	2.85
April, "	297	45	9	55	131,600	4,387	65,006,700	2,166,890	12.95	1.94
May, "	382	30	12	20	155,200	5,006	87,130,800	2,810,671	12.41	1 44
June, "	430	35	14	21	160,200	5,340	98,349,000	3,278,300	11.47	.73
July, "	346	0	11	10	126,800	4,090	76,117,800	2,455,413	10.56	6.49
August, "	337	15	10	43	124.600	4,019	73,701,600	2,377,471	10.06	3.48
September, "	332	5	11	4	121,800	4,060	70,862,100	2,362,070	9.39	1.63
October, "	337	25	10	53	122,900	3,965	71,690,600	2,312,584	8.82	2.63
November, "	330	5	11	0	121,400	4,047	71,455,200	2,381,840	8.52	2.25
Total	4,034	35	...	...	1,618,800	.....	886,898,400	....	......	33.31
Daily Average	11	1	...	...	4,423	.....	2,423,220	....	11.09	

Stock on Hand, Dec. 1, 1880.

780 tons Cumberland coal; 45 gallons cylinder oil; 40 gallons machine oil; 12 gallons kerosene; ½ gallon benzine; ¾ gallon boiled oil; 1 gallon raw oil; ¾ gallon oil polish; 20 pounds cotton waste; 25 pounds rubber packing; 5 pounds hemp packing; 3 pounds Tuck's packing; 3 pounds asbestos packing; 24 9-inch rubber valves; 2 valve seats; 2 steam-gauges; 10 pounds Babbitt metal; 2 pounds solder; 3 pounds red lead; 3 pounds mercury; 10 pounds steel; 5 pounds sheet brass; 1¼ bales hair felt; 24 pounds soap; 15 feet 5-inch rubber belting; 10 files; 2 pounds emery; ½ quire emery cloth; 10 gauge-glasses; 12 lamp-chimneys; 3 dozen lamp-wicks; 2 lantern-globes; ½ barrel cement; ½ barrel kaoline; ¼ barrel brimstone; 10 grate bars; 300 fire brick; 300 pounds bolts and nuts; 1 pair plungers and rings for No. 2 engine; 20 feet 2-inch brass pipe; 30 feet 1¼-inch brass pipe; 7 feet ½-inch brass pipe; 12 feet ¼-inch brass pipe; 6 feet 3-inch iron pipe; 25 feet 1¼-inch iron pipe; 16 feet ¾-inch iron pipe; 40 feet ¼-inch iron pipe; 3 1½-inch globe-valves; 40 elbows; 18 T's; 12 unions; 20 nipples; 32 plugs; 30 couplings; 2 crosses; 22 bushings; 10 feet 24-inch flange pipe; 8 feet 6-inch flange pipe.

Tools, Furniture, and Instruments.

1 18-inch × 10 feet engine lathe; 1 lathe chuck; 6 lathe dogs; 8 lathe tools; 1 grindstone; 1 3 × 9 engine with shafting, belting, etc.; 1 vise and vise bench; 1 set pipe dies; 1 set pipe taps; 2 pipe cutters; 14 pairs pipe tongs; 1 set hand taps; 2 hand hammers; 1 copper hammer; 18 cold chisels; 8 files; 5 screw wrenches; 1 back saw; 1 Stillson wrench; 22 fork wrenches; 27 socket wrenches; 1 hydrant wrench; 6 gate wrenches; 2 clamp screws; 2 sledges; 2 ratchets; 18 drills; 1 breast drill; 2 jack-screws; 6 steel bars; 2 soldering irons; 4 cylinder head cranes; 1 level; 1 gasket cutter; 2 ladles; 12 eye bolts; 75 starting bolts; 2 starting keys; 1 chain fall; 2 wooden horses; 1 oil cabinet; 1 set measures; 1 6-gallon can; 3 3-gallon cans; 3 1-gallon cans; 2 lamp fillers; 2 funnels; 4 squirt cans; 1 oil pump; 1 carpenter's

bench; 4 planes; 4 hand-saws; 10 chisels; 7 gouges; 3 screw-drivers; 2 bit-stocks; 13 bits; 4 augers; 1 draw-knife; 1 spoke-shave; 2 axes; 2 mallets; 1 steel square; 1 set fire tools; 1 coal car; 1 pair platform scales; 1 wheelbarrow; 15 scoop shovels; 2 long handled shovels; 3 picks; 1 tube brush; 1 forge; 1 anvil; 5 pairs tongs; 2 hand chisels; 1 lawn mower; 2 steel rakes; 2 wooden rakes; 2 scythes; 3 forks; 1 weeder; 1 spade; 6 ladders; 3 step-laddders; 1 cast-iron roller; 200 feet 2-inch hose and pipe; 100 feet ¾-inch hose and pipe; 1 desk; 2 tables; 2 clocks; 18 chairs; 9 mats; 6 spittoons; 1 water cooler; 6 fire pails; 5 water pails; 4 bracket lamps; 4 lanterns; 2 hand lamps; 1 lot cocoa matting; 1 watering-pot; 1 dust-pan; 2 dust-brushes; 1 window-brush; 1 floor-brush; 2 scrubbing-brushes; 2 mops; 1 barometer; 1 hygrophant; 1 thermometer; 2 rain gauges; 1 snow gauge.

EXPENDITURES OF WATER WORKS.

From the Auditor's Report.

Water Works (Construction).

Amount appropriated		$30,000 00
EXPENDED.		
For Advertising	$14 00	
Cement	7 50	
Diving, submarine	75 00	
Dredging	800 00	
Engine, use of	166 75	
Experts, services for Water Commission	1,500 00	
Freight on pipe	510 00	
Gates	656 75	
Hydrants	20 00	
Iron work	688 96	
Labor, as per pay-roll	4,295 67	
Land damages	1,367 69	
Lead	695 46	
Legal services	100 00	
Lumber	2,167 05	
Meters	466 40	
Packing	42 32	
Piles	1,494 37	
Pipe	8,844 44	
Sand	36 00	
Scow and tools, use of	389 56	
Amounts carried forward	$24,337 92	$30,000 00

Amounts brought forward . . .	$24,337 92	$30,000 00
For Siphon, sinking	500 00	
Teaming	303 11	
Tools	93 01	
Total, as per item No. 42 of expenses		25,234 04
Balance unexpended		$4,765 96

Water Works (Maintenance).

Amount appropriated	$5,000 00
Add amount transferred	25,000 00
	$30,000 00

EXPENDED.

For Advertising	$4 50	
Boxes, gate and service	578 16	
Car tickets	105 00	
Chimney repairs	350 00	
Clerical assistance	1,057 00	
Clerk of board, salary	200 00	
Directories	7 50	
Diving, submarine	166 00	
Drain, repairs	30 05	
Expressage	54 19	
Fuel	4,746 93	
Gauges, repairs	35 73	
Hardware and tools	292 19	
Harnesses and repairs	70 10	
Hay, grain, and straw	232 60	
Horse clipping	3 00	
Horse keeping	309 50	
Horse-shoeing	69 91	
Hose	18 50	
Hydrants, repairs	12 64	
Inspectors, services of	1,159 00	
Iron-work, casting	115 19	
Amounts carried forward . . .	$9,617 69	$30,000 00

Amounts brought forward . .	$9,617 69	$30,000 00
For Labor, as per pay-roll . . .	9,346 33	
Leak, tracing	5 00	
Lime and cement.	54 89	
Lithographing.	18 50	
Lumber.	373 99	
Manure	45 25	
Meters, repairs	64 56	
Newspapers, subscription . .	11 50	
Notices, delivering	22 00	
Oil and waste	243 43	
Packing gaskets	60 32	
Painting	34 91	
Pipes and fittings.	990 43	
Plumbing	44 03	
Printing	123 94	
Registrar, J. W. Cotton, salary	2,000 00	
Seals	70 85	
Stationery	271 07	
Stone	30 80	
Stone work, leading	21 00	
Superintendent, Hiram Nevons, salary	1,800 00	
Superintendent, travelling expenses	15 50	
Teaming	88 25	
Telephone, use of	7 18	
Tools, repairing	97 81	
Tube, speaking	8 96	
Veterinary services	9 50	
Wagon repairs	92 30	
Water, analysis of	70 00	
Wall repairs	90 50	
Wharf, rent of	50 00	
Whitewashing	25 50	
Window shades	59 50	
Total, as per item No. 43 of expenses. . . .		25,865 49
Balance unexpended.		$4,134 51

Water Works (Rates, Fines, etc.).

RECEIVED.

For amount of rates, fines, etc., as per item No. 36 of receipts	$175,762 59
Less amount transferred	162,611 00
	$13,151 59

EXPENDED.

For water rates refunded, as per item No. 44 of expenses	1,413 63
Balance unexpended	$11,737 96

Water Works (Supplies).

RECEIVED.

For supply pipe and fittings, as per item No. 37 of receipts	$3,762 52

EXPENDED.

For labor, as per pay-roll	$678 73	
Pipes and fittings	1,316 48	
Total, as per item No. 45 of expenses		1,995 21
Balance unexpended		$1,767 31

REPORT

OF THE

TRUSTEES OF THE SINKING FUND OF THE CAMBRIDGE WATER WORKS.

To the Honorable the City Council:

THE undersigned, Trustees of the Sinking Fund of the Cambridge Water Works, herewith submit the Annual Report of the fund committed by ordinance to their charge: —

The amount of the fund, Dec. 1, 1879, was	$353,468 02	
There have been received during the year interest on investments amounting to	19,928 89	
There has been received from the City of Cambridge, being three per cent on amount of outstanding Water Bonds,	45,855 00	
		$419,251 91
Amount paid for accrued interest on securities purchased	$407 50	
Amount paid for premium on securities purchased	4,275 93	
		4,683 43
Amount of the fund, Nov. 30, 1880, all securities at par,		$414,568 48

The increase of the Fund during the year has been $61,100.46. This increase, while somewhat less than that reported last year, is nevertheless accounted for by the increased amount paid for premium on investments made.

The following are the securities belonging to the Fund: —

Cambridge Low-land Loan, six per cent coupon bonds, maturing July 1, 1883,	$1,000 00	
Cambridge Water, six per cent coupon bonds, maturing Aug. 1, 1883 . . .	1,400 00	
Cambridge City, six per cent coupon bonds, maturing April 1, 1884 . . .	3,000 00	
Cambridge Water, six per cent coupon bonds, maturing April 1, 1887 . . .	6,000 00	
Cambridge Water, six per cent coupon bonds, maturing April 1, 1888 . . .	25,000 00	
Cambridge Water, six per cent coupon bonds, maturing May 1, 1889 . . .	6,000 00	
Cambridge Water, six per cent coupon bonds, maturing July 1, 1890 . . .	31,000 00	
Cambridge Water, six per cent coupon bonds, maturing May 1, 1891 . . .	26,000 00	
Cambridge Water, six per cent coupon bonds, maturing July 1, 1892 . . .	1,000 00	
Cambridge Water, six per cent coupon bonds, maturing April 1, 1895 . . .	37,000 00	
Cambridge Water, six per cent coupon bonds, maturing July 1, 1896 . . .	46,000 00	
Cambridge Water, six per cent coupon bonds, maturing July 1, 1897 . . .	16,000 00	
Cambridge Water, five per cent registered coupon bonds, maturing July 1, 1898,	12,500 00	
		$211,900 00
United States five per cent coupon bonds, maturing after May 1, 1881	$54,500 00	
City of Providence five per cent registered bonds, maturing Sept. 1, 1882 . . .	42,000 00	
State of Connecticut six per cent coupon bonds, maturing Jan. 1, 1883. . .	1,000 00	
City of Providence five per cent registered bonds, maturing Sept. 1, 1883 . . .	5,000 00	
City of Charlestown five per cent coupon bonds, maturing Oct. 1, 1883 . . .	1,000 00	
City of Boston five per cent coupon bonds, maturing April 1, 1885	8,000 00	
City of Boston five per cent coupon bonds, maturing Jan. 1, 1886	1,000 00	
City of Burlington, Vt., six per cent coupon bonds, maturing July 1, 1886 . .	500 00	
City of Gloucester four and one half per cent coupon bonds, maturing July 1, 1890	5,000 00	
Amounts carried forward	$118,000 00	$211,900 00

Amounts brought forward	$118,000 00	$211,900 00
City of Fall River five per cent coupon bonds, maturing May 1, 1898 . . .	2,000 00	
Town of Pawtucket, R. I., five per cent coupon bonds, maturing April 1, 1899,	25,000 00	
City of Providence four and a half per cent coupon bonds, maturing June 1, 1899,	3,000 00	
City of Boston four per cent registered bonds, maturing April 1, 1900 . . .	4,000 00	
City of Fall River four per cent coupon bonds, maturing Aug. 1, 1900 . . .	13,000 00	
United States four per cent coupon bonds, maturing after July 1, 1907	37,500 00	
		202,500 00
		$414,400 00
Cash balance in First National Bank, Cambridge . . .		168 48
		$414,568 48

RECAPITULATION.

Cambridge Water Bonds at six per cent,	$195,400 00	
Cambridge Water Bonds at five per cent,	12,500 00	
Cambridge Low-land Loan Bonds at six per cent	4,000 00	
City and Town Bonds at six per cent . .	1,000 00	
City and Town Bonds at five per cent . .	87,500 00	
City and Town Bonds at four and one half per cent	5,000 00	
City and Town Bonds at four per cent .	17,000 00	
United States Bonds at four per cent . .	37,500 00	
United States Bonds at five per cent . .	54,000 00	
		$414,400 00
Cash Balance in First National Bank		168 48
		$414,568 48

The Bonded Water Debt, which the foregoing fund is expected to pay, matures as follows, viz.: —

July 1, 1881	$50,000 00
Aug. 1, 1883	55,000 00
July 2, 1886	100,000 00
April 1, 1887	150,000 00
April 1, 1888	175,000 00
May 1, 1889	112,000 00
July 1, 1890	60,000 00
May 1, 1891	50,000 00
Amount carried forward	$752,000 00

Amount brought forward	$752,000 00
July 1, 1892	335,000 00
April 1, 1894	150,000 00
April 1, 1895	160,000 00
July 1, 1896	103,000 00
July 1, 1897	16,000 00
July 1, 1898	12,500 00
	$1,528,500 00

JAMES M. W. HALL,
CHARLES WALKER,
WM. W. DALLINGER,
Trustees of the Sinking Fund of the Cambridge Water Works.

CAMBRIDGE WATER BOARD, 1881.

GEORGE P. CARTER . . . . *President.*

Members of Board.

THE MAYOR,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

KNOWLTON S. CHAFFEE,	*term expires*	1885.
GEORGE P. CARTER,	" "	1884.
HENRY L. EUSTIS,	" "	1883.
CHESTER W. KINGSLEY,	" "	1882.
J. WARREN MERRILL,	" "	1881.

JUSTIN A. JACOBS, *Clerk.*

HIRAM NEVONS, *Superintendent of Works.*
J. WARREN COTTON, *Water Registrar.*

Trustees of Sinking Fund of Water Loan.

THE MAYOR,
CITY TREASURER,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

P 32019

City of Cambridge.

THE

SEVENTEENTH ANNUAL REPORT

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL,

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS,

FOR THE YEAR 1881.

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TRIBUNE PUBLISHING COMPANY.
1882.

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☆ CAMBRIDGE PUB. LBRY

REPORT

OF THE

CAMBRIDGE WATER BOARD.

To the Honorable City Council of the City of Cambridge: —

The Cambridge Water Board herewith submits to you its seventeenth annual report, in accordance with the requirement of the city ordinance.

Total Cost of the Works.

Cost of the Water Works, Nov. 30, 1880, as per last year's report	$1,721,830 54
Expended on construction account during the year ending Nov. 30, 1881	6,824 81
Making total expenditure	$1,728,655 35

Water Bond Account.

Whole amount of water bonds issued	$1,714,900 00
Less amount paid from the Water Loan Sinking Fund to Nov. 30, 1881	236,400 00
Leaving unpaid water debt	$1,478,500 00
Deduct from this the value of the Water Loan Sinking Fund, per Trustees' account	427,630 31
Leaving amount yet to be met as provided for by the Sinking Fund	$1,050,869 69

Statement showing in brief the transactions on account of the water works for the year ending Nov. 30, 1881: —

Received.

From water rates	$171,135 52	
Less water rates refunded	1,072 79	
		$170,062 73
Shutting off and letting on water, and fines		690 50
Rent of house		144 00
From supply account		3,710 78
		$174,608 01

Expended.

For construction account	$6,824 81
For maintenance account	23,833 89
For supply account	2,928 68
Interest on water debt	91,585 00
Paid into Sinking Fund	45,855 00
Balance showing gain in 1881	3,580 63
	$174,608 01

Comparative Receipts.

Water rates for the year ending Nov. 30, 1880	$173,325 49
Water rates for the year ending Nov. 30, 1881	170,062 73
Showing loss in 1881 to be	$3,262 76
The reduction on hydrants made during the year was	$8,865 00
Deduct the loss in receipts as stated above	3,262 76
Showing the real comparative gain in 1881 to be	$5,602 24

Water Supply.

By reference to the report of the superintendent, it will be seen that the total amount of water pumped during the year was 902,319,300 gallons, being a daily average of 2,472,108 gallons. A full supply has been furnished during the season for drinking fountains, fire hydrants, and watering the streets.

The water in the pond Dec. 1, 1880, stood eight and one eighth inches below the top of the conduit. At the same date this year it stood two feet five and seven eighths inches above the top of the conduit, being a gain of three feet one inch.

Fresh Pond reached its lowest level on the 9th and 10th of February, 1881, being 1.27 feet below the top of the conduit; this being the lowest level that we have any record of. At that time the water in the well-room was below the reach of the injection pipes of one of the pumps, while the other was so nearly in the same condition that it was considered unsafe to continue to use it, and it was therefore found necessary to start the centrifugal pump on the border of the pond to pump into the conduit. This pump, as we notified you in our last report, had been provided for such an emergency, and our experience proved that it was not procured any too soon. This pump was run six days, when a heavy rain set in which raised the water in the pond, and we have not had occasion to use the pump since.

It will be seen that for several days our entire supply of water was furnished through the pump on the border of the pond pumping into the conduit. Had a break occurred in this pump or machinery, our only recourse would have been the connecting pipe with the Boston Water Works.

On the 18th of April, 1881, the water in the pond reached the highest level during the year, being 7.04 feet above the conduit. We have no doubt the water would have reached high-water mark, if the drainage from the muck heaps of Niles Brothers had not mingled to so great an extent with the water running into Wellington Brook; this made it necessary to shut off the water from running into the pond through the conduit. The conduit was opened and closed at various times until May 21, since which time no water has come into the pond from Wellington Brook on account of its impure condition.

On Feb. 25, 1881, Messrs. Niles Brothers were ordered by the Board of Health to cease putting any more refuse stuff from their slaughter-house on the muck heaps after that date; and that order has been obeyed.

Comparative Rainfall and Height of Water in the Pond during the Year.

MONTHS.	Rainfall.			Below high-water mark.		
	1879.	1880.	1881.	1879.	1880.	1881.
	Inches.	Inches.	Inches.	Feet.	Feet.	Feet.
December, 1880	4.30	3.76	1.98	2.18	4.87	8.52
January, 1881	2.20	2.62	5.03	2.26	4.87	8.55
February, "	3.48	3.49	4.14	2.92	4.60	8.20
March, "	4.02	2.85	6.07	2.72	4.14	2.65
April, "	5.66	1.94	1.86	1.62	3.90	0.98
May, "	1.28	1.44	3.32	1.50	4.44	1.26
June, "	4.59	0.73	6.27	1.79	5.38	1.72
July, "	2.64	6.49	3.41	2.27	6.29	2.36
August, "	5.79	3.48	1.13	2.79	6.79	3.24
September, "	1.71	1.63	2.74	3.11	7.46	4.07
October, "	0.76	2.63	2.85	3.97	8.03	4.87
November, "	3.18	2.25	4.08	4.58	8.33	5.23
Total	39.64	33.31	42.85	Av. 2.64	Av. 5.76	Av. 4.30

It will be seen that we had 9.54 inches more rainfall in 1881 than in 1880; this being about seven inches below the average. We are dependent upon the rainfall of a comparatively small area, and this we can secure only when it comes in large quantities at times when the ground is covered with snow or frozen. This combination of circumstances cannot be relied upon. They almost entirely failed us in 1880, which brought us into an emergency; but this year we were again favored, which relieved us. It is not prudent or safe for a great city like Cambridge longer to depend upon such uncertain sources for her water supply.

Purity of the Water.

It has long been the desire of the board to prevent the foul water of Cider Mill Pond from flowing into Fresh Pond, by closing the culvert in Cushing Street; but after consultation with the city solicitor, we refrained from doing so, and asked for an appropriation by the City Council to construct a sewer at an expense of $10,000, which was granted; but in the month of March last, as this street was now under the control of the city of Cambridge, the suggestion was renewed, and the culvert was closed by an order of the Board of Aldermen, March 22, 1881, and no water has flowed from this pond into Fresh Pond since that date. We trust that under no circumstances will its foul water be allowed to contaminate Fresh Pond in the future.

It is a source of gratification that, while we have heard many and well-grounded complaints from other places about the poor quality of the water furnished, our water has maintained its good name and quality, giving general satisfaction to our customers. The analyses that we have had show that there is but little change in the water. It will be our duty to guard well this fine natural reservoir that has been provided for us, and to see that nothing is introduced into it that will tend to deteriorate the quality of the water.

Leakage and Waste.

Continued efforts have been made during the year to ascertain and stop all leaks and waste of water. As a result of these efforts, 415 leaks have been stopped, of which 39 were found in main pipes, 85 in supply pipes, and 291 on premises of water takers. These last named were reported by the inspectors and repaired by the owners or occupants. There have been sold by measure 37,554,550 gallons more water this year than last year, while the amount of water pumped this year more than last is but 15,420,900 gallons; showing a gain of 22,133,650 gallons, although there have been added 201 new supplies during the year.

By reference to the report of the superintendent, it will be seen that in the month of November the chronograph at the reservoir recorded a loss of 137,175 gallons between the hours of 12 midnight and 4 A. M., this being 34,293 gallons per hour. Of this amount it was ascertained as near as possible that 7,000 gallons flowed through meters, leaving 27,293 gallons used for other legitimate consumption and waste, an amount but a fraction over two quarts *per capita* per hour. By this it will be seen that our pipes must be in excellent condition in regard to waste of water and leaks, as by experiment we have found that the entire amount of water as above ascertained used during the night, for various purposes, and including wastes and leaks, are all together only equal to about the amount that would be delivered through a two-inch pipe at the level of the corner of Harvard and Inman Streets.

This favorable result, we think, is largely due to the untiring efforts of our superintendent, who has worked day and night to reduce the waste and leakage of water to a minimum.

High Service.

Continual and well-grounded complaints have been made for years past by our citizens residing on Washington Avenue and Arlington Street, that they could not obtain an adequate supply of water under the present system. A careful examination of the whole subject of high-service supply has been made, and a plan adopted by the board, which was submitted to the City Council with the request that an appropriation of $10,000 be made that the same might be carried into effect. The plan proposed by the City Engineer contemplates an additional pumping engine, of 1,000,000 gallons capacity in twenty-four hours, at the present pumping station, and a new force main extending to the reservoir, there connecting with the overflow pipe of the standpipe, which it is proposed to use as a standpipe for the new high-service system. New lines of pipe will be laid to the several sections which it is desired to supply, embracing those portions of Arlington, Observatory, and Reservoir Hills situated above grade 60. Check valves and gates will be placed at suitable points on the mains now leading to these sections, by which arrangement interference with the present method of supply will be avoided, in case it should become necessary or desirable to resort to this method. The City Council having made the appropriation, the board has made contracts for the necessary pump and pipes, and the work will be commenced in the spring. Its early completion will be no less gratifying to those of our citizens who have so long suffered and so patiently waited for a supply of water, than it will be to the Water Board, that this long and perplexing question has at last been so satisfactorily and economically settled.

Additional Supply of Water.

We would again call your attention to the importance of securing at an early day an additional and ample supply of pure water. Our own experience the past few years is warning enough, while in addition the complaint has come to us this year from other cities, almost universally complaining of short supply. The experience of nearly all the water works we know anything about shows that the sources of supply are overrated, and the wants of the people are underrated, at first. In a growing city like Cambridge, where the supply we have has been so thoroughly tested, and the prospective demand must be large, we do well to heed these lessons, and act with wisdom in providing for both the present and future wants of our city.

An application was made last winter for the right to take water from Shawsheen River. The committee to which the Legislature referred our application, after a fair hearing of our case, reported a bill giving us the right to take the water; but in the Senate the bill was opposed, the result being that it was referred to the next Legislature.

We would therefore earnestly recommend that every reasonable effort be made this winter to secure from the Legislature the right to take a part of the water from Shawsheen River; with this right secured, we think Cambridge will be well provided with an ample supply of pure water for many years to come. We are not aware of any other source of supply that can be got at a reasonable expense. We say reasonable expense, because while the first outlay may seem large, yet the benefits that the city will derive from it will more than compensate; indeed, we do not see how we can long continue without additional supply.

General Remarks.

The Water Board believes that the Water Works were never in better condition than at the present time, and that they will compare favorably with the best in the country, except in the lack of an adequate supply of water.

With the exception of the construction of the proposed high service, no large expenditure will be required the ensuing year. We do not think there will be any necessity of increasing the debt of the Water Works on account of construction the coming year, as our present means and resources will be sufficient to pay for all extensions contemplated. A line of small pipe has been laid into the Belmont District, and it is proposed to re-enforce this with a larger pipe. The northwest corner of the reservoir needs repairing; and we intend laying new pipes in McCabe, Jefferson, and a portion of Porter Street, in accordance with the recommendations of the superintendent, to take the place of pipes now laid so deep that it will not pay to remove or raise them.

GEORGE P. CARTER,
C. W. KINGSLEY,
JAMES M. W. HALL,
H. L. EUSTIS,
K. S. CHAFFEE,
JAMES A. FOX,
CHARLES WALKER,
} *Water Board.*

Analysis of Water from Fresh, Spy, and Little Ponds, by Prof. E. S. Wood, during the season of 1881.

Figures express parts per 100,000 of water.

Date.	Locality.	Filtered or Unfiltered.	Free Ammonia.	Albuminoid Ammonia.	Chlorine.	Total Residue.	Hardness.	Remarks.
1881.								
Jan. 31.	End of pumping conduit	Filtered.	0 0368	0.0182	1.61	14.20	9°	
" 31.	Faucet	"	0 0181	0.0200	1.61	19.51	8°	
Feb. 9.	End of pumping conduit	"	0.0338	0.0178	1.50	16.90	8°	
" 9.	Faucet	"	0.0184	0.0224	1.50	13 60	7½°	
" 12.	Faucet	"	0.0088	0.0206	1.80	13.10	8°	
" 12.	Water flowing from muck heap	"	4.6940	8.9420	2.70	37.10	2°	Very foul odor.
" 19.	From muck heap	"	0.1240	0.0678	0.70	5.10	½°	Foul, but not as bad as Feb. 12.
March 8.	Wellington Brook, Brighton Street	"	0.0342	0.0380	0.58	5.20	4½°	
" 8.	Wellington Brook, Flume	"	0.0302	0.0370	0.64	6.30	8°	
" 4.	Faucet, 4.45 P. M.	"	0.0208	0.0182	1.80	15.70	8°	
" 5.	Faucet, 9.30 A. M.	"	0.0202	0.0244	1.80	15.80	7½°	
" 6.	Faucet, 12 M.	"	0 1120	0.0210	1.70	13. 0	7½°	
" 11.	Faucet, 10 A. M	"	0.0182	0.0278	1.80	13.80	9½°	
May 24.	Richardson's Pond	"	0.0098	0.0478	0.94	14.20	4°	Large amount of organic matter.
June 7.	Fresh Pond, 200 feet from conduit	"	0.0011	0.0240	1.70	11.90	7°	
" 7.	Faucet	"	0.0018	0.0248	1.70	18.30	7°	
Dec. 7.	Fresh Pond, 200 feet from conduit	"	0.0413	0.0342	1.60	16.80	6½°	
" 7.	Faucet	"	0.0282	0.0170	1.60	14.20	6½°	

REPORT

OF THE

WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, Dec. 8, 1881.

To the Cambridge Water Board: —

THE undersigned herewith presents his Sixth Annual Report, showing the receipts, expenditures, and abatements for the year ending Nov. 30, 1881, together with a statement of the number of water-taker, fixtures, etc., as required by city ordinance.

Amount of bills remaining unpaid Nov. 30, 1880: —

Water rates	$328 66	
Meter rates	92 53	
Supplies and repairs	604 52	
		$1,025 71

Amount of bills placed in hands of City Treasurer for collection from Dec. 1, 1880, to Dec. 1, 1881: —

Water rates	$140,139 47	
Meter rates	34,683 61	
Supplies and repairs	3,983 36	
Off and on water, seals, fines, and rent	834 50	
		179,640 94
Total		$180,666 65

Deduct.	Abated.	Unpaid.	
Water rates	$3,588 69	$423 17	
Meter rates	1 25	95 64	
Supplies and repairs	296 98	580 12	
	$3,886 92	$1,098 93	4,985 85
Balance			$175,680 80

Receipts.

Water rates	$136,456 27	
Meter rates	34,679 25	$171,135 52
Off and on water, seals, and fines	$690 50	
Rent of house at pipe yard	144 00	
		834 50
Total rates, fines, etc.		$171,970 02
Supplies and repairs		3,710 78
Total		$175,680 80
Amount reported by City Treasurer as received by him		175,680 80

Expenditures.

Construction account		$6,824 81
Supply account		2,928 68
Maintenance account, viz.: —		
Care and repairs	$12,337 43	
Pumping service	6,375 78	
Office expenses	5,120 68	
		23,833 89
Total		$33,587 38

Abatements.

Abatements of water rates have been made during the year to the amount of	$3,589 94
Abatements on supply and repair account	296 98
Total	$3,886 92

The above amount of abatements is caused by the necessary abatement of all charges upon supplies shut off or fixtures sealed before the books can be balanced. New charges are then made when the water is again let on.

Refunds.

Water rates have been refunded to the amount of	$1,072 79
Which amount deducted from receipts	171,135 52
Leaves net receipts for water	$170,062 73

Water has been shut off for non-payment of rates, or per order of owners on account of vacancy, and seals have been applied by request of owners or occupants, as follows: —

Supplies shut off in 1881	434
Supplies let on in 1881	356
New supplies let on in 1881	184
Supplies let on, shut off in previous years	62
Seal locks applied to fixtures in 1881	473
Seal locks removed from fixtures in 1881	204
Seal locks removed, put on in previous years	248

Water rates unpaid Nov. 30, 1881	$144 17
City water rates unpaid Nov. 30, 1881	279 00
Meter rates unpaid Nov. 30, 1881	95 64
Supplies and repairs unpaid Nov. 30, 1881	580 12
Total	$1,098 93

Statement of the yearly revenue received from water rates since the purchase of the works by the city: —

From	April 28, 1865,	to	Dec. 1, 1865	$32,367 19
"	Dec. 1, 1865,	"	1, 1866	40,073 27
"	" 1, 1866,	"	1, 1867	52,733 62
"	" 1, 1867,	"	1, 1868	63,747 42
"	" 1, 1868,	"	1, 1869	76,149 30
"	" 1, 1869,	"	1, 1870	92,606 95
"	" 1, 1870,	"	1, 1871	111,782 65
"	" 1, 1871,	"	1, 1872	127,201 30
"	" 1, 1872,	"	1, 1873	146,117 32
"	" 1, 1873,	"	1, 1874	153,634 27
"	" 1, 1874,	"	1, 1875	138,880 37
"	" 1, 1875,	"	1, 1876	179,166 76
"	" 1, 1876,	"	1, 1877	154,843 59
"	" 1, 1877,	"	1, 1878	157,443 91
"	" 1, 1878,	"	1, 1879	164,681 90
"	" 1, 1879,	"	1, 1880	173,325 49
"	" 1, 1880,	"	1, 1881	170,062 73

The reduction of receipts this year, instead of a proportional increase, is caused by the City Council's reduction of hydrant rates from $30 each to $15 each per annum.

Comparative Statement.

	1880.		1881.	
Construction Account.				
Received	....	$25,234 04		
Expended	....	25,234 04	....	$6,824 81
Supply Account.				
Received	....	$3,762 52	....	$3,710 78
Expended	....	1,995 21	....	2,928 68
Excess of receipts	....	$1,767 31		$782 10
Maintenance Account.				
RECEIVED.				
Rates, Fines, etc.	....	$174,348 96		$170,897 23
EXPENDED.				
Care and Repairs	$25,865 49		$23,833 89	
Interest on Water Debt	91,585 00		91,585 00	
Paid to Sinking Fund Commissioners,	45,855 00		45,855 00	
		163,305 49		161,273 89
Excess of Receipts		$11,043 47		$9,623 34
Supply Account, Excess of Receipts		$1,767 31		$782 10
Maintenance Account, Excess of Receipts		11,043 47		9,623 34
		$12,810 78		$10,405 44
Deduct expended on Construction Account				6,824 81
Excess of Total Receipts over Total Expenses				$3,580 63

The matter of the amount due the Sinking Fund, alluded to in my last report, and by your board brought to the attention of the City Council, was then referred to the Committee on Finance, together with the City Solicitor's opinion that the Sinking Fund is entitled to all unexpended balances of receipts; but as yet, the account has not been audited as requested. Having brought my accounts to a definite total in the report for last year, I have included in this year's statement only receipts and expenditures since Nov. 30, 1880, adopting that as a starting point for any subsequent differences.

No action has been taken by the City Council during the past year upon the proposition to change the time for payment of water rates, although the same reasons still apply, and the complaints increase. Many citizens evidently expected the change this year.

As required by ordinance, all premises supplied with Fresh Pond water have been visited during the year, and a careful inspection has been maintained to prevent as far as possible a waste of water; but many householders still fail to appreciate the necessity of careful use of water, every gallon of which has to be pumped to such a height to enable them to enjoy its benefits.

Two hundred and one new supplies have been laid during the year, three being in place of former extensions from other supplies. Eighteen of the above were laid in the new territory annexed to Cambridge, formerly a part of the town of Belmont. Twenty of the new supplies have not yet been paid for, nor water let on.

One hundred and fifty-seven meters are now in use, an increase of only one over last year; nine having been placed in various locations during the year, and eight removed.

Besides the manufactories, etc., supplied by meter, water is now supplied to 11,076 families, 803 stables, with 2,005 horses and 277 cows, 231 shops, 269 stores and offices, by the following fixtures, viz.: —

13,314 faucets.
3,639 wash basins.
2,080 wash tubs.
1.930 bath tubs.
4,666 pan closets.
754 slop closets.
27 hopper closets.
60 urinals.
71 yard hydrants.
5 fountains.
3 tumbler washers.
905 hand hose.

Also, —

577 fire hydrants (besides 4 on private premises).
14 fire reservoirs.
15 drinking fountains in public squares.

The above is exclusive of the school-houses, engine houses, police stations, and other city buildings, for which special rates are charged, except where meters are located.

Respectfully submitted,

J. WARREN COTTON,
Registrar.

REPORT

OF THE

COMMITTEE ON ACCOUNTS OF THE CAMBRIDGE WATER BOARD.

We have examined the abstract of accounts as presented by the Water Registrar, covering the records of the past year. We have compared these with the statements submitted to us by the City Treasurer and Auditor, and we find them to agree. Annexed, in brief, is the financial statement presented to us by the Water Registrar, and verified by us.

Amount of bills in City Treasurer's hands uncollected Nov. 30, 1880: —			
For water rates		$328 66	
" meter rates		92 53	
" supplies and repairs		604 52	$1,025 71
Amount of bills deposited with City Treasurer for collection during the year ending Nov. 30, 1881: —			
For water rates		$140,139 47	
" meter rates		34,683 61	
" supplies and repairs		3,983 36	
" turning off and on, seals and fines		690 50	
" rent of house at pipe yard		144 00	179,640 94
Of these amounts the Treasurer has collected	$175,680 80		
Less refunded	1,072 79		
		$174,608 01	
Refunded as above		1,072 79	
Abated		3,886 92	
Balance uncollected, Nov. 30, 1881		1,098 93	
		$180,666 65	$180,666 65

JAMES M. W. HALL, } *Committee on*
JAMES A. FOX, } *Accounts.*

November 30, 1881.

REPORT

OF THE

SUPERINTENDENT OF THE WATER WORKS.

To the President and Members of the Cambridge Water Board: —

GENTLEMEN, — The annual report of your Superintendent upon the condition of the works and the operations of the past year is herein presented.

The total amount of water pumped is 902,319,300 gallons.

Coal consumed per million gallons pumped, 1,650.16 pounds.

Water sold by meter and that used for watering streets, 208,025,800 gallons; leaving as the amount for domestic use, 694,293,500 gallons.

Number of gallons daily for each inhabitant on whole amount pumped, 46¾ gallons.

Number of gallons daily for each inhabitant, on amount for domestic use, 36 gallons.

Spy and Little Ponds, Wellington Brook, and Conduit.

The gates are in good condition. No water has been drawn from Spy Pond. The water was analyzed with the usual result, — not fit for use. The filter basin appears to be in good condition; it has not been used since March last.

No change in the condition of Wellington Brook and its branches is apparent since my last report. Water was drawn from this source at all available times during the months of February, March, and April, but much of the storm water was lost on account of the drainage from Niles Brothers' muck heaps mingling with it. The amount of water wasted from this cause was great, and it is a serious evil that these muck heaps still remain to menace the Wellington Brook supply, from which source we ought to secure a large amount of water when the snow thaw comes in the spring.

No inspection of the conduit has been made, owing to the water being so high; it appears to be in good condition.

Fresh Pond.

The pond reached its lowest point on the 9th and 10th of February, — namely, 7.73 (the least height heretofore recorded or known), — when it became necessary to start the centrifugal pump, pumping into the conduit, as the pumps would just take the water. This extreme low water, happening in the cold weather, when we were having an excessive draught on account of water being run to waste to protect service pipes from freezing, would have put the city in a precarious situation if we had not had the connection with Boston pipes to fall back on. We were at this time depending on the small pump alone for the whole supply. This pump was run six days; in the mean time the pond commenced rising, and continued to gain gradually until April 18, when it reached its highest point for this year, — viz., 16.04.

At the present time it is 2.48 feet above the top of the conduit, being 3.16 feet higher than at the same time last year. Nothing has been done on the borders of the pond during the year. The water has been very clear and free from weeds. Slight repairs have been made on the house for the centrifugal pump, where it was damaged by the ice in the spring. This pump and engine are in good condition, and ready for immediate action should occasion require it.

The Engine House

Lot and Tudor Park have received the usual care. The grass has been cut, walks graded, and fences repaired. Nearly all the trees are in a flourishing condition. Both pumps have been painted and varnished; the two old boilers thoroughly repaired, all the tubes having been taken out and cleaned and large sheets put on over the fire boxes. The Engineer's report shows the condition of the engines and boilers.

Reservoir.

The iron fence around the basin has been painted, the grass cut, and walks kept in repair. The gates are in good condition.

There is no more leakage than at the date of my last report. Nothing has been done to the retaining wall except to point a few places where the frost had thrown the cement out. The retaining wall on the west side, near the north corner, should be repaired in the spring, as there is danger of the banks yielding, which would cause serious trouble. The chronograph is in perfect working order, and has run constantly during the year. By its record, our consumption during the night hours, from 12 to 4, is less than last year. The minimum fall of the reservoir water height, for these four hours during November, 1881, was 3.95 inches, equivalent to 137,175 gallons discharged, or 34,293 gallons hourly. Of this amount, 7,000 gallons are metered, leaving 27,293 gallons for consumption and waste, or a little more than two quarts per inhabitant per hour.

Distribution Pipes.

The most important extensions have been of four-inch and six-inch pipes in Mt. Auburn, Holworthy, and Locust Streets, Belmont District. As many calls for water have come from Cushing Street, and a long line of small pipe only is now laid, which it is not practicable to extend any farther unless it can be backed up by a return line, I recommend that an eight-inch pipe be laid from Elmwood Avenue, on Mt. Auburn Street, to and in Cushing Street. This would furnish a good supply to the whole district, and give fire protection also.

About two hundred feet of twelve-inch and twenty-inch pipe, on Front and Sydney Streets, have been raised on account of the new sewer; the four-inch main at Green and Sydney Streets was also cut and offset over the sewer. The pipe in Warren Street and Porter Street, from Warren to Bedford Streets, has been raised. It was intended to raise all of the pipes in this district, but from their being so deep, it would cost more to raise them than the laying of new pipe, so that project has been abandoned; and I recommend that a new pipe be laid in McCabe, Jefferson, and that portion of Porter Street not raised, since most of the supplies on these streets are seven and eight feet deep, and will have to be renewed.

New Supplies.

Two hundred and one new supplies have been laid during this season, making the present total 7,523. One hundred old supplies have been renewed, and 97 sidewalk shut-offs have been put on to old supplies. A total number of 416 leaks have been stopped; viz., 1 on thirty-inch pumping main, 2 on twenty-inch cement pipe, 2 on sixteen-inch pipe, 1 on twelve-inch pipe, 2 on ten-inch cement pipe, 1 on ten-inch iron pipe, 3 on eight-inch pipe, 4 on six-inch pipe, 23 on four-inch pipe, 85 on supply pipes, and 291 reported by the inspector and repaired by the owner or occupant.

I earnestly recommend the adoption of lead pipe for service in all of the marsh territory. Most of our leaks are on galvanized service pipes, which will not last more than three or four years in these localities.

A thorough inspection of all fixtures on premises has been made (except in Ward Five), with good results; and I have no doubt, if this inspection is persistently continued, our consumption may be kept where it is for a long time.

Sixty-four gate and 33 hydrant boxes have been set in place of decayed ones removed. The renewal of boxes is an important element in our maintenance account, and learning that kyanized spruce lumber had given good satisfaction in Lowell and Boston, that material is now being used.

Brookline Street Pipe Bridge.

A base board has been put on both sides of the bridge to prevent the action of ice from starting the sheathing, and the whole bridge has been painted.

Hydrants, etc.

Two new post and one flush hydrant have been set in new locations, and one post hydrant in place of a flush hydrant on Waterhouse Street at Garden. The present number is 582, of which 242 are post and 340 flush hydrants. The number of garden hydrants remains the same as last year.

Nine new meters have been set, and 8 have been removed. The present total is 157.

The number of drinking fountains and standpipes for street watering remains the same as at date of last report.

Pipe Yard.

The dwelling-house has been raised, a cellar dug, and a stone and brick foundation put in. The roof of the shed has been shingled, a new fence built in front of the house and painted. The buildings are now all in good repair.

Accompanying this report is that of the engineer at the pumping works, and tables showing the monthly amount and daily average of water pumped, the Fresh Pond record of water heights, the locations of standpipes and meters, the details of main and supply extensions, and the amount of stock on hand.

Respectfully submitted,

HIRAM NEVONS, *Superintendent.*

CAMBRIDGE, Dec. 5, 1881.

List of Meters in Use Nov. 30, 1881.

METERS.	Locality.	Size.	Description.
		Inches.	
Andrews, A. H.	Ninth St.	⅝	Désper.
American Rubber Co.	Potter St.	4	Worthington.
American Net and Twine Co.	Third St.	1½	"
American Steam Safe Co.	Main St.	1	"
Badger & Daniels.	Thorndike St.	⅝	Union Rotary.
Baptist Church	Central Sq.	⅝	Worthington.
Bird, H. M. (Iron Foundry)	Broadway.	⅝	Union Rotary.
Boston Bolt and Nut Co.	Portland St.	⅝	Désper.
Boston Woven Hose Co.	Broadway.	⅝	Worthington.
Boston Stamping Co. (Tin Ware Manufactory).	Third St.	2	"
Boston Chemical Works	Third St.	⅝	"
Boston & Lowell R. R. (Repair Shop)	Bridge St.	2	"
Boston & Lowell R. R. (Round House)	Prison Point St.	2	"
Boston & Lowell R. R. (New Round House)	Prison Point St.	2	Crown.
Boston & Lowell R. R. (Paint Shop)	Prison Point St.	1	Worthington.
Boston & Lowell R. R. (Filling Locomotives).	Prison Point St.	6	Union Rotary.
Broomhead, M. (Coffee Grinding)	Columbia St.	1	Worthington.
Bullock, O. S. (Machine Shop)	Broadway	1	"
Carr Brothers (Soap Factory)	Lopez St.	1	"
Capen, Sprague & Co. (Oil Works)	Sixth St.	⅝	Désper.
Cambridge Skating Rink	Broadway.	1½	Worthington.
Cambridgeport Diary Co.	Magazine St.	1	"
Cambridge Gas Light Co.	Third St.	2	"
Campbell Bros. (Boiler Factory)	Osborn St.	⅝	Désper.
City of Cambridge (Shepard School)	North Ave.	2	Worthington.
City of Cambridge (Ward One Building)	Brattle Sq.	2	"
City of Cambridge (Ward Four Building)	Central Sq.	1½	"
City of Cambridge (Cemetery)	Coolidge Ave.	4	"
City of Cambridge (Almshouse)	Tannery St.	2	"
Close, Geo. (Confectionery)	Broadway.	1	"
Clark, B. P. & Co. (Confectionery)	Main St.	1½	"
Cochran, A. & Co. (Ammonia Factory)	Potter St.	⅝	"
Coleman, John & Sons (Coal Wharf)	Broadway.	1	"
Cooper's Car Wheel Co.	Hampshire St.	⅝	"

List of Meters in Use Nov. 30, 1881. — *Continued.*

METERS.	Locality.	Size.	Description.
		Inches.	
Cofran, S. M. (Brick Yard)	Concord Ave	1½	Worthington.
Coolidge, J. G. (Floral Conservatory)	Coolidge Ave	1	"
Davis, Curtis & Co. (Soap Factory)	Broadway	1½	"
Davis, J. C. & Son (Soap Factory)	Broadway	1	"
Davis, Mason (Soap Factory)	Lincoln St	⅝	"
Dailey, Charles W. (Livery Stable)	Cambridge St	1	"
Downing, Theo. (Tannery)	Eustis Ct	1	"
Draper, F. & Co. (Brass Works)	Otis St	¾	"
Eastern Dredging Co	Western Ave	2	"
East Cambridge Club Stable	First St	1	"
Ela Brothers (Ivory Turning)	Broadway	1	"
Episcopal Theological Seminary Dormitory	Brattle St	1½	"
Fenton, N. & Co. (Mattress Factory)	Gore St	¾	Désper.
French, C. A. (Hotel)	Farwell Pl	1	Worthington.
Geldowsky, F. (Furniture Manufactory)	Otis St	1	"
Gilmore & Eustis (Cambridge Rolling Mill)	Portland St	2	"
Goepper Bros. (Barrel Factory)	Ninth St	2	"
Greene, A.T. & Co.(Manuf'y of Artists' Colors)	State St	⅝	Union Rotary.
Greely, Leander (Planing Mill)	Broadway	1½	Worthington.
Griffin & Dolan (Soap Factory)	Decatur St	¾	"
Harvard College (Boylston Hall)		1	"
Harvard College (Holworthy Hall)		¾	"
Harvard College (Stoughton Hall)		⅝	"
Harvard College (Seaver Hall)		⅝	"
Harvard College (Thayer Hall)		1½	"
Harvard College (In Yard)		1½	"
Harvard College (Memorial Hall)	Cambridge St	2	"
Harvard College (Boat-House)	Flagg St	¾	Ball & Fitts.
Harvard College (Botanical Garden)	Garden St	1	Worthington.
Harvard College (Gymnasium)	Cambridge St	1½	"
Harvard College (Holyoke House)	Harvard St	2	"
Harvard College (Museum Comp. Zoöl.)	Divinity Ave	1	"
Harvard College (Scientific School)	Kirkland St	⅝	Désper.
Hazlett, W. H. & Co. (Planing Mill)	Otis St	1½	Worthington.
Hale, Teele & Bisbee (Soap Factory)	Davis St	¾	Désper.
Hews, A. H. & Co. (Pottery)	Crescent Ave	1	Worthington.
Hixon, Edward & Co. (Furniture Manuf'y)	Harvard St	¾	"
Holmes, F. M., Manuf. Co. (Furniture)	Cambridge St	2	"
Houghton, H. O. & Co. (Publishers)	Blackstone St	2	"
Hovey & Co., North Side (Floral Conservatory)	Cambridge St	1	"
Hovey & Co., South Side (Floral Conservatory)	Cambridge St	1	"
Jaynes & Co. (Barrel Factory)	Pacific St	⅝	Ball & Fitts.
Jones, C. L. & Co. (Soap Factory)	Pearl St	¾	Worthington.
Kemp, L. & Son (Soap Factory)	Davis St	1	Ball & Fitts.
Kennedy, F. A. (Cracker Factory)	Green St	1	Désper.
Kendall & Roberts (Iron Works)	Main St	¾	Worthington.
Low, J. W. (Tannery)	Reed St	1½	"
Loan, J. J. (Soap Factory)	Columbia St	⅝	Union Rotary.
Little Brown & Co. (Book Bindery)	Blackstone St	⅝	Worthington.
Lincoln & Chamberlain (Slaughter House)	Distillhouse St	¾	"
Mason & Hamlin Organ Co	Broadway	1	"
Middlesex Bleachery (Dye Works)	Sacramento St	¾	"
Middlesex County (House of Correction)	Thorndike St	2	"
Middlesex County (Court House)	Thorndike St	¾	Ball & Fitts.
Middlesex County (Court House)	Otis St	⅝	"
Middlesex County (Registry of Deeds)	Otis St	⅝	Worthington.
Millian, Alex. (Fish Market)	Brattle St	¾	Désper.
Moring, Mrs. A. L. (Beck Hall)	Main St	1	Worthington.
Mount Auburn Corp. (Floral Conservatory)	Brattle St	1	"
Mount Auburn Corp. (Cemetery)	Mt. Auburn St	¾	Désper.
Murdock, Walter H. (Floral Conservatory)	Grigg St	⅝	"
New England Glass Co	North St	2	Worthington.
Norton, E H. (Soap Factory)	Winsor St	¾	Désper.
O'Brien, John (Slaughter House)	Beech Ave	1	Worthington.
Page, Geo. G. & Co. (Box Factory)	Hampshire St	2	"
Parry Bros. & Co. (Brick Yard)	Raymond St	⅝	"
Pike, James & Co. (Livery Stable)	Church St	1	"
Porcellian Club (Harvard Students)	Harvard St	⅝	Désper.
Porter's Hotel (Frank Locke)	North Ave	¾	"
Prospect House (Joseph Uhrig)	Main St	1½	Worthington.
Ross House (Mrs H. P. Ross)	Broadway	⅝	"
Reardon, John & Sons (Oleomargarine Fact'y)	Talbot St	4	"
Reardon, William (Soap Factory)	Portland St	⅝	Désper.

List of Meters in Use Nov. 30, 1881. — *Concluded.*

METERS.	Locality.	Size.	Description.
		Inches.	
Revere Sugar Refinery (South Side)...........	Water St.........	3	Worthington.
Revere Sugar Refinery (North Side)...........	Water St.........	3	Union Rotary.
Reversible Collar Co...........................	Mt. Auburn St....	1	Worthington.
Rhoades, Silas & Son (Planing Mill)...........	State St...........	2	"
Rideout, M. E. & D. T. (Planing Mill).........	Banks St.........	¾	"
Roberts, O. P....................................	Brattle St.........	1	"
Rogers, Geo. M..................................	Washington St...	3	"
Russ Moulding Co...............................	Thorndike St.....	⅝	Crown.
Sands, John L., estate of (Brick Yard).........	Walden St........	⅝	Worthington.
Sanborn, G. P. & Son (Pickling Factory)......	Gore St...........	⅝	Désper.
Shorey, Geo. L. (Laundry).....................	Soden St..........	1½	Worthington.
Shaw & Applin (Furniture Manufactory)......	Bridge St.........	1½	"
Smart, D. C. (Wood Turning)..................	Main St...........	⅝	Désper.
Sortwell & Co. (Distillery).....................	Distillhouse St....	2	Worthington.
Squire, John P. & Co. (Slaughter House)......	Gore St...........	2	"
Squire, John P. & Co. (Slaughter House)......	Gore St...........	2	"
Squire, John P. & Co. (Stable)................	Gore St...........	1	"
St. Mary's Church..............................	Norfolk St.........	2	"
Stiles, John C. (Omnibus Stable)..............	Cambridge St.....	2	"
Stiles, John C. (Watering Horses).............	Inman Sq..........	⅝	Désper.
Tower, Sylvester (Piano Key Manufactory) ...	Broadway........	1	Worthington.
Tug "Henry Chapel" (Steamboat).............	First St...........	2	"
Thayer, Henry & Co. (Laboratory)............	Broadway.........	2	"
Tribune Publishing Co.........................	Linden St.........	⅝	Désper.
Tracey, M. F......................................	Brighton St.......	1	"
Union Railway Co. (Washing Cars)............	Dunster St	⅝	Worthington.
Union Railway Co. (Repair Shop).............	Dunster St.	⅝	"
Union Railway Co. (Car House)...............	Dunster St.	⅝	"
Union Railway Co. (Wooden Stable)	Dunster St.	⅝	"
Union Railway Co. (Brick Stable)	Dunster St.	1½	"
Union Railway Co. (North Side)	Cambridge St.....	1	"
Union Railway Co. (South Side)..............	Cambridge St.....	1	"
Union Railway Co. (Stable)....................	Baldwin St........	1	"
Union Railway Co. (Stable)....................	Mt. Auburn St....	1	"
Union Railway Co. (Stable)....................	Main St...........	1	Union Rotary.
Union Railway Co. (Stable)....................	North Ave....	2	Worthington.
Union Railway Co. (Car House).............. .	Cambridge, cor. Baldwin St.	1	"
Union Railway Co. (Stable)....................	River St...........	1	"
Union Railway Co. (Stable)	Murray St.........	1½	"
Union Railway Co. (Washing Cars)	Murray St.........	1½	Crown.
Union Glass Co. (Packing Room)..............	Webster Ave.....	⅝	Désper.
Union Glass Co. (Pot Room)..................	Webster Ave.....	1	Worthington.
Warren, J. H. (Felton Hall)..................	Cambridge St.....	1½	"
Walworth Manufacturing Co...................	Main St...........	1½	"
Wellington, J. A. & Co. (Coal Wharf).........	Fifth St...........	⅝	"
Wilson, John & Son (Publishers)..............	Brattle Sq.........	1	"
Woodbridge, S. F. (East Slaughter House)....	Frank St..........	1	"
Woodbridge, S. F. (West Slaughter House)...	Frank St..........	⅝	"
Woods, Geo. & Co. (Organ Factory)	Main St...........	2	"
Wight & Scorgie (Marble Polishing)...........	Mt. Auburn St....	½	Désper.

List of Drinking Fountains, Nov. 30, 1881.

Bridge Street, junction of Cambridge Street.
Broadway, southwest corner of Norfolk Street.
Brattle Square, east side of Brewer's Block.
Brattle Street, junction of Fresh Pond Lane.
Cambridge, south corner of Fifth Street.
Central Square, west side.
Central Square, east side.
Fort Washington.

Hampshire Street, junction of Broadway.
Harvard Square, at the flag staff.
Inman Square, east side.
Main Street, junction of Front Street.
Main Street, junction of Mt. Auburn Street.
North Avenue, southwest corner of Walden Street.
North Avenue, north side, west of Cameron Street.
Putnam Avenue, southwest corner of Pearl Street.
Third Street, west side, north of Main Street.

List of Standpipes (for Street Watering), Nov. 30, 1881.

Brattle Street, near University Press.
Brattle Street, corner of Sparks Street.
Brattle Street, near Fayerweather Street.
Brattle Street, near Fresh Pond Lane.
Bridge Street, junction of Cambridge Street.
Broadway, near Third Street.
Broadway, corner of Sixth Street.
Broadway, corner of Winsor Street.
Broadway, junction of Hampshire Street.
Brookline Street, corner of Putnam Avenue.
Cambridge, near Warren Street.
Cambridge, near Winsor Street.
Cambridge, at Inman Square.
Columbia, near Austin Street.
Concord Avenue, at junction of Garden Street.
Dana, at corner of Chatham Street.
Dublin, near Fitchburg Railroad.
Gore, west of Third Street.
Green, near Western Avenue.
Harvard, corner of Prescott Street.
Inman, near Broadway.
Kirkland, near Quincy Street.
Main, near Portland Street.
Main, near Hancock Street.
Magazine, opposite Warland Street.
Mt. Auburn, near Athens Street.
North Avenue, near Common.

North Avenue, corner of Sacramento Street.
North Avenue, near Roseland Street.
North Avenue, near Beech Street.
North Avenue, near Spruce Street.
North Avenue, corner of Norris Street.
North Avenue, opposite Tannery Street.
Prison Point Street, opposite Round House.
Third Street, near Rogers Street.
Thorndike, near Third Street.
Western Avenue, near Howard Street.

New Main Pipe, laid for Extensions and Renewals, from Dec. 1, 1880, to Nov. 30, 1881, inclusive, with the Number of Gates and Fire Hydrants used.

LOCATION.	IRON PIPE.		GATES.		FIRE HYDRANTS.	
	Size.	Length.	No.	Size.	No.	Size.
	Inch.	Feet.		Inch.		Inch.
Fairmont Ave	4	216				
Pearl Street, west from Tufts Street	4	234				
Charles Street, from Sixth to Fifth Street	6	470	1	6		
Greenough Ave., east from Ellsworth Ave	4	150	1	4		
Mt. Auburn St. (Belmont District)	4	108	1	4		
Mt. Auburn Street, under railroad track to Holworthy Street	4	203	1	6		
Holworthy Street	4	695				
Holworthy Street	6	394	..	..	1	6
Locust Street	6	331	..	..	1	6
Cushing Street, at Locust Street	8	36				
Elm Street, south from Broadway	4	144				
Bay Street, north from Franklin Street	4	108	1	4		
Magazine Street, at Central Square	1	92				
Waverly Street, east from Allston Street	1¼	455				
Second Street, south from Spring Street	4	240				
Holly Street	1½	34				
Ninth Street, north from Binney Street	1½	142				
Hawthorn Street	4	259	1	4		
Maynard Place	1½	175				
Green Street, north side of Sydney Street	..	.....	1	4		
Spring and Ninth Streets	..	.....	..	..	1	3 Flush
Hastings Square, west	4	36				
Kirkland Place (Belmont District)	1¼	153				
Kirkland Place (Belmont District)	1	51				
Eliot Square	..	.....	1	4		

Recapitulation.

	8 in.	6 in.	4 in.	1½ in.	1¼ in.	1 in.	Totals.
Length of iron pipe in feet	36	1,195	2,393	351	608	143	4,726
Number of gates	.....	2	6	....	....	....	8
Hydrants	.....	....	....	....	....	....	3

Statement of Stock on Hand, Dec. 1, 1881.

FOR STREET MAINS (IRON PIPE AND FITTINGS).

NUMBER OF —	48 in.	30 in.	24 in.	20 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Straight pipes (12 feet each).......	2	25	..	17	16	23	110	2	131	93	..
Elbows............	..	..	..	..	2	..	2	..	..	..	..
Bends (1 36″)	..	..	2	2	..	..	10	..	13	..	..
Y Branches........	..	..	1	..	..	1	..	..	..	..	..
Sleeves............	..	2	4	8	2	2	2	1	5	8	11
Clamp sleeves	..	..	3	2	..	4	4	5	3	3	6
Drain offsets......	..	..	..	..	..	..	..	..	21	..	..
Offsets............	..	..	..	..	..	..	6	..	7	7	..
Gates............	..	..	..	..	..	3	1	..	1	2	1
Check-valves (old).	..	..	2	..	..	..	..	..	..	..	..
Blow-off branches.	..	..	..	2-6″	..	..	..	..	..	..	..
Caps............	..	..	2	..	2	7	5	3	2	6	..
Plugs............	..	..	..	..	..	1	1	2	1	..	..
Crosses..........	..	..	..	..	1-12″	4-3″	7-6″	..	..	..	..
	..	..	..	1-20′	..	..	..	1-8″	10-4″	16-4″	..
	..	..	..	..	3-6″	1-4″	2-8″	..	..	..	..
	..	..	..	2-10″	..	..	..	..	5-6″	..	..
	..	..	..	..	..	6-6′	2-10″	..	..	..	..
	..	..	..	..	..	5-10″	..	..	..	..	..
Reducers.........	..	..	1-10″	2-12″	1-6″	2-10″	8-8″	6-6″	9-4″	6-3″	..
	..	..	1-8′	1 8″	..	1-6″	3-6″	..	..	..	..
T's..............	..	..	1-8″	3-20″	1-6″	8-10″	4-8″	13-6″	11-6″	..	..
	..	..	1-24″	2-6″	..	6-6″	19-6″	2-4″	8-4″	15-4″	..
	..	..	3-6″	2-12′	..	5-4″	10-10′	4-8″	..	..	..

FOR SUPPLIES (GALVANIZED PIPE AND BRASS FITTINGS).

	2½ in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
Length of galvanized pipe.........	16	17	15	13	45	285	
Elbows..............................	..	24	20	10	6	53	22
Street elbows......................	..	...	....	...	...	60	
Couplings..........................	..	100	11	9	100	40	54
Unions for lead pipe...............	..	...	....	...	...	20	
Unions..............................	..	8	4	16	15	73	24
Stop and wastes....................	..	1	....	...	23	35	
Screw cocks........................	..	1	....	...	4	45	
Sidewalk cocks.....................	..	...	....	...	4	20	
Screw cocks for cement pipes	..	...	5	...	56	2	
Blow-off cocks.....................	..	...	6	...	...	....	
Hose bibbs.........................	..	...	....	...	13	5	19
Air chambers.......................	..	...	....	...	56	....	95
Socket end of rods.................	..	...	....	...	...	25	
Nipples............................	2	30	20	50	20	15	67
Plugs..............................	..	...	7	1	25	9	
Bushings...........................	2	9	10	15	60	16	6
T's, malleable iron................	..	...	....	...	6	60	44
T's, cast iron.....................	..	280	120	100	100	400	
Crosses............................	..	70	110	90	80	30	
Reducing couplings.................	..	...	....	...	...	94	
Caps...............................	..	...	....	...	...	....	24
Standpipes, 11.							

New Supplies.

GALVANIZED PIPE AND BRASS FITTINGS, USED FROM DEC. 1, 1880, TO NOV. 30, 1881, INCLUSIVE.

	4 in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.	Total.
Length of galvanized pipe...	53	132	150	153	593	7,499	..	8,580
Number of supplies..........	1	3	1	3	6	187	..	201
Number of stop and wastes..	..	2	...	3	6	186	..	197
Number of screw cocks......	..	3	...	4	4	164	..	175
Number of sidewalk cocks...	..	...	...	...	2	178	..	180
Number of faucets..........	..	...	...	...	...	3	19	22
Number of standpipes.......	..	...	...	...	...	....	..	186

Stock in Shop and at Yard.

2 horses.
4 wagons.
3 harnesses.
1 double-runner sled.
1 pung.
4 blankets.
2 oil covers for horses.
1 hay cutter.
1 large boom derrick.
1 breast derrick.
3 small derricks.
1 lathe with the usual chucks and tools.
1 platform scale.
1 water motor.
1 pipe-threading machine with dies from ½″ to 2″.
2 die plates from 1¼″ to 2″.
4 plates from ½″ to 1″.
1 set of pipe taps from ½″ to 2″.
1 drilling machine.
1 large hand pump.
8 thawing pumps.
2 hydrant wrenches.
9 pipe wrenches.
3 monkey wrenches.
1 breast drill.
2 tapping machines for supplies.
3 2″ cock wrenches.
2 1″ cock wrenches.
6 sidewalk cock wrenches.
12 gate wrenches.
3 blow-off wrenches.
8 pairs of tongs.
7 pipe cutters.
4 tool chests.
14 lanterns.
2 bench vises.
5 rammers.
25 picks.
30 shovels.
4 chains.
2 hand carts.
3 lead kettles and furnaces.
8 pails.
242 seals.
350 pounds of lead.
3 inside parts of post hydrants.
3 garden hydrants.

25 old flush hydrants.
3 drinking fountains.
4 hydrant boxes.
15 small gate boxes.
13 large gate boxes.
5 2″ cock boxes.
5 large frames and covers.
4 small frames and covers.
1½ barrels of cement.
2 screws for raising main pipe.
120 risers for gate boxes.
2 2″ meters.
5 ⅝″ meters.
3 2″ counter and ratchet movements.
2 1½″ counter and ratchet movements.
2 1″ counter and ratchet movements.
3 ⅝″ counter and ratchet movements.
6 2″ meter dials.
2 1½″ meter dials.
5 1″ meter dials.
6 $_8$″ meter dials.

REPORT

OF THE

ENGINEER AT THE PUMPING STATION.

PUMPING STATION, CAMBRIDGE WATER WORKS,
CAMBRIDGE, Dec. 1, 1881.

Hiram Nevons, Esq., Supt. Cambridge Water Works: —

SIR, — During the past year the engines have required only the usual running repairs. Both engines have been painted and varnished. Boilers Nos. 3 and 4, which have been in use for thirteen years, began during the past year to show signs of failing; the sheets at the joints in the furnaces cracking from the rivets out to the edges of the sheets. The tubes have been taken out, scaled, and pieced out; the furnace sheets cut out, and new ones double the length of the old ones put in, doing away with joints directly over the fire. The furnaces have been relined with fire-brick, and new mouthpieces put in. These boilers are now in good condition, and will probably last for several years. The other boilers are in good condition, and will not require more than the usual repairs the coming year.

The auxiliary engine and pump are in perfect order, and ready for use at short notice. Following will be found a statement of the expenses at the pumping station, together with the engine record, pond levels, and rainfall for the past year; also a list of stock, tools, etc., on hand.

E. C. BROOKS, *Engineer.*

Statement.

$664\frac{1648}{2240}$ tons Cumberland coal, @ $5.74	$3,815 56
Oil, waste, packing, etc.	225 09
Salaries	3,341 25
Repairs on engines and boilers	885 18
Tools	6 00
Repairs on buildings and care of grounds	120 72
Total	$8,393 80

Engine Record, Pond Levels, and Rainfall.

DATE.	Total Running Time.		Daily Average Running Time.		Total Coal consumed.	Daily Av. Coal consumed.	Total Water pumped.	Daily Average Water pumped.	Average Height of Pond.	Rainfall.
	Hours.	Min.	Hours.	Min.	Pounds.	Pounds.	Gallons.	Gallons.	Feet.	Inches.
December, 1880	336	50	10	52	120,000	3,871	69,891,900	2,254,577	8.33	1.98
January, 1881	391	0	12	37	141,600	4,568	81,885,300	2,641,461	8.30	5.03
February, "	373	45	13	21	129,200	4,614	75,468,000	2,695,286	8.65	4.14
March, "	336	15	10	51	119,000	3,839	68,148,000	2,198,323	14.20	6.07
April, "	317	5	10	34	111,900	3,730	67,557,000	2,251,900	15.87	1.83
May, "	357	30	11	32	116,700	3,765	77,748,600	2,508,019	15.59	3.32
June, "	365	45	12	11	118,300	3,943	78,227,100	2,607,570	15.13	6.27
July, "	383	20	12	22	130,000	4,194	81,523,200	2,629,780	14.49	3.41
August, "	382	10	12	19	129,500	4,177	82,938,900	2,675.448	13.61	1.18
September, "	363	30	12	7	127,900	4,263	78,396,600	2,613,220	12.78	2.74
October, "	349	20	11	16	128,700	4,152	74,116,500	2,390,858	11.98	2.85
November, "	314	50	10	30	116,200	3,873	66,418,200	2,213,940	11.62	4.08
Total............................	4,271	20	...	...	1,489,000	....	902,319,300	....	..	42.85
Daily average....................	11	42	...	...	4,079.4	....	2,472,108	....	12.55	

Stock on Hand, Dec. 1, 1881.

$453\frac{2190}{2240}$ tons Cumberland coal; 35 gallons cylinder oil; 20 gallons machine oil; 3 gallons kerosene; 1½ gallons benzine; ½ gallon boiled oil; 1 gallon raw oil; ¾ gallon oil polish; 50 pounds cotton waste; 20 pounds rubber packing; 2 sheets asbestos packing; 10 pounds hemp packing; 3 pounds Tuck's packing; 6 cylinder-head gaskets; 24 9-inch rubber valves; 2 valve seats; 2 steam gauges; 12 pounds Babbitt metal; 1 pound solder; 2 pounds red lead; 10 pounds steel; 5 pounds sheet brass; 1¼ bales hair felt; 8 pounds soap; 15 feet 5-inch belting; 8 files; 1½ pounds emery; ¼ quire emery cloth; 2 gauge glasses; 8 lamp chimneys; 2 dozen lamp wicks; 2 lantern globes; ¼ barrel brimstone; 300 pounds bolts and nuts; 1 pair plungers and rings for No. 2 engine; 20 feet 2-inch brass pipe; 30 feet 1¼-inch brass pipe; 7 feet ½-inch brass pipe; 12 feet ¼-inch brass pipe; 6 feet 3-inch iron pipe; 20 feet 1¼-inch iron pipe; 20 feet ¾-inch iron pipe; 40 feet ¼-inch iron pipe; 3 1½-inch globe valves; 25 elbows; 15 T's; 8 unions; 20 nipples; 24 plugs; 30 couplings; 2 crosses; 20 bushings; 10 feet 24-inch flange pipe; 8 feet 6-inch flange pipe.

Tools, Furniture, and Instruments.

1 18-inch × 10-foot engine lathe; 1 lathe chuck; 6 lathe dogs; 18 lathe tools; 1 grindstone; 1 3 × 9 engine, with shafting, belting, etc.; 1 vise and vise bench; 1 set pipe dies; 1 set pipe taps; 2 pipe cutters; 14 pairs pipe tongs; 1 set hand taps; 2 hand hammers; 1 copper hammer; 18 cold chisels; 8 files; 5 screw wrenches; 1 hack saw; 1 Stillson wrench; 22 fork wrenches; 27 socket wrenches; 1 hydrant wrench; 6 gate wrenches; 2 clamp screws; 2 sledges; 2 ratchets; 18 drills; 1 breast drill; 2 jack screws; 6 steel bars; 2 soldering irons; 4 cylinder head cranes; 1 level; 1 gasket cutter; 2 ladles; 12 eye bolts; 75 starting bolts; 2 starting keys; 1 chain fall; 2 wooden horses; 1 oil cabinet; 1 set measures; 1 10-gallon can; 1 6-gallon can; 3 3-gallon cans; 3 1-gallon cans; 2 lamp fillers; 2 funnels; 4 squirt cans; 1 oil pump; 1 carpenter's bench; 4 planes; 4 hand saws; 10 chisels; 7

gouges; 3 screw drivers; 2 bit stocks; 13 bits; 4 augers; 1 draw knife; 1 spoke shave; 2 axes; 2 mallets; 1 steel square; 1 set fire tools; 1 coal car; 1 pair platform scales; 1 wheelbarrow; 11 scoop shovels; 4 long-handled shovels; 3 picks; 1 tube brush; 1 forge; 1 anvil; 5 pairs tongs; 2 hand chisels; 1 lawn mower; 2 steel rakes; 2 wooden rakes; 1 scythe; 3 forks; 1 weeder; 1 spade; 6 ladders; 3 step ladders; 1 cast-iron roller; 200 feet 2-inch hose and pipe; 100 feet ¾-inch hose and pipe; 1 desk; 2 tables; 2 clocks; 18 chairs; 9 mats; 6 spittoons; 1 water cooler; 6 fire pails; 5 water pails; 4 bracket lamps; 4 lanterns; 2 hand lamps; 1 lot cocoa matting; 1 watering pot; 1 dust-pan; 2 dust brushes; 1 window brush; 1 floor brush; 2 scrubbing brushes; 2 mops; 2 brooms.

Tools, Furniture, etc., at Engine House at Pond.

1 12-inch × 20-inch portable engine and boiler; 1 12-inch centrifugal pump and belt; 1 hand force pump; 1 stove and pipe; 30 feet 1-inch hose; 10 feet ¾-inch steam hose; 1 set fire tools; 2 oil cans; 2 bracket lamps; 2 chairs; 1 cot bed and bedding.

EXPENDITURES OF WATER WORKS.

From the Auditor's Report.

Water Works (Construction).

Amount appropriated		$20,000 00
EXPENDED.		
For Boats, use of	$10 00	
Engine on border of Fresh Pond	1,806 50	
Engine, use of at Pond	36 75	
Engineer	47 25	
Fuel	19 50	
Hardware and tools	89 25	
Iron work	58 45	
Labor, as per pay-roll	863 03	
Lead	112 45	
Lumber for pipe house at Brookline Bridge	216 40	
Mason work at border of Pond	19 50	
Meters	194 25	
Packing	17 84	
Paving	18 90	
Piles and driving at border of Pond,	713 97	
Pump at borders of Pond	490 00	
Painting	135 00	
Pipes	1,204 80	
Pumping house at border of Pond,	477 22	
Stone	25 16	
Swing valves	232 65	
Teaming	35 94	
Total, as per item No. 43 of expenses		6,824 81
Balance unexpended		$13,175 19

Water Works (Maintenance).

Estimated revenue		$30,000 00
EXPENDED.		
For Advertising	$24 63	
Analysis of water	110 00	
Belting	3 78	
Blacksmithing	218 99	
Bricks	4 50	
Car tickets and fares	95 56	
Castings	90 33	
Civil engineer, expert, Shawsheen River	100 00	
Clerk of board	200 00	
Clerical aid	983 33	
Directories	9 50	
Engineer at supply pump . . .	66 00	
Expressage	9 15	
Furniture at pumping house . .	25 63	
Fuel	1,954 35	
Gate and hydrant boxes and lumber	481 27	
Gravel	52 49	
Hardware and tools	264 45	
Harnesses, repairs of	31 70	
Hay, grain, and straw	315 07	
Horse keeping	124 10	
Horse-shoeing	75 80	
Horse clipping and veterinary services	8 75	
Horse hire	10 00	
Hose	25 00	
Hydrants, repairs on	116 88	
Inspectors' services	1,152 50	
Labor, as per pay-roll	9,663 47	
Lime and cement	31 25	
Manure and grass seed	21 26	
Amounts carried forward . . .	$16,269 74	$30,000 00

Amounts brought forward	$16,269 74	$30,000 00
For Mason work	48 85	
Machinery, repairs of	6 28	
Meters, repairs of	31 18	
Mowing, Tudor Park	10 00	
Newspapers	8 50	
Oil, waste, and packing	232 28	
Painting	263 13	
Paving	3 60	
Pipes and fitting	1,212 58	
Pipe bridge, repairs of	125 77	
Plumbing	29 73	
Postage	83 00	
Printing	118 10	
Pumping house, repairs at	59 78	
Raising house and repairing shed at pipe yard	414 00	
Registrar, J. Warren Cotton, salary	2,000 00	
Rent of office	400 00	
Rent of shop	200 00	
Rent of wharf	50 00	
Repair of leak	6 80	
Removing night soil	8 00	
Salt	15 15	
Stationery and account books	76 03	
Superintendent, Hiram Nevons, salary	1,800 00	
Supply pump, fittings, and repairs,	75 69	
Teaming	71 20	
Telephone, repairs and telegraphing	9 23	
Travelling expenses	26 32	
Wagons, repairs of	174 45	
Whitewashing	4 50	
Total, as per item No. 44 of expenses		23,833 89
Balance unexpended		$6,166 11

Water Works (Rates, Fines, etc.).

RECEIVED.

For amount of rates, fines, etc., as per item No. 35 of receipts	$171,970 02
Less amount transferred	167,440 00
	$4,530 02

EXPENDED.

For water rates refunded, as per item No. 45 of expenses	1,072 79
Balance unexpended	$3,457 23

Water Works (Supplies).

Estimated revenue		$3,000 00

RECEIVED.

For supply pipes and fittings, as per item No. 36 of receipts	$3,710 78	

EXPENDED.

For Labor, as per pay-roll	$870 09	
Pipes and fittings	2,058 59	
Total, as per item No. 46 of expenses		2,928 68
Balance unexpended		$71 32

REPORT

OF THE

TRUSTEES OF THE SINKING FUND OF THE CAMBRIDGE WATER WORKS.

To the Honorable the City Council:—

THE undersigned, Trustees of the Sinking Fund of the Cambridge Water Works, herewith submit the annual report of the fund committed by ordinance to their charge.

The amount of the fund Dec. 1, 1880, was	$414,568 48	
There has been received during the year, interest on investments amounting to	22,291 50	
There has been received premium on securities sold, amounting to . . .	1,985 00	
There has been received from the city of Cambridge three per cent on the amount of outstanding water bonds, viz.:	45,855 00	
		$484,699 98
Amount paid for accrued interest on securities purchased for investment .	$1,079 67	
Amount paid as premium on securities purchased for investment	5,990 00	
Amount paid the City Treasurer of Cambridge to meet the amount of water bonds which matured July 1, 1881, viz.:	50,000 00	
		57,069 67
Leaving the amount of the fund, Nov. 30, 1881, all securities at par		$427,630 31

The following is a list of the securities belonging to the fund: —

Cambridge Low-land Loan, six per cent coupon bonds, maturing July 1, 1883,	$1,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing Aug. 1, 1883,	1,400 00	
Cambridge City Loan, six per cent coupon bonds, maturing April 1, 1884	3,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1887	6,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1888	25,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing May 1, 1889	6,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1890	31,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing May 1, 1891	26,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1892	1,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1895	37,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1896	46,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1897	16,000 00	
Cambridge Water Loan, five per cent registered bonds, maturing July 1, 1898	12,500 00	
		$211,900 00
City of Providence five per cent registered bonds, maturing Sept. 1, 1882	$42,000 00	
State of Connecticut six per cent coupon bonds, maturing Jan. 1, 1883	1,000 00	
City of Providence five per cent registered bonds, maturing Sept. 1, 1883	5,000 00	
City of Charlestown five per cent coupon bonds, maturing Oct. 1, 1883	1,000 00	
City of Boston five per cent coupon bonds, maturing April 1, 1885	8,000 00	
City of Boston five per cent coupon bonds, maturing Jan. 1, 1886	1,000 00	
City of Burlington, Vt., six per cent coupon bonds, maturing July 1, 1886	500 00	
Amounts carried forward	$58,500 00	$211,900 00

Amounts brought forward	$58,500 00	$211,900 00
City of New Bedford four per cent coupon bonds, maturing Oct. 1, 1889 .	8,000 00	
City of Gloucester four and one half per cent coupon bonds, maturing July 1, 1890	5,000 00	
City of Fall River four per cent coupon bonds, maturing May 11, 1895 . .	9,000 00	
City of Fall River five per cent coupon bonds, maturing May 1, 1898 . . .	2,000 00	
Town of Arlington five per cent coupon bonds, maturing July 1, 1898	30,000 00	
Town of Pawtucket, R. I., five per cent coupon bonds, maturing April 1, 1899,	25,000 00	
City of Providence four and one half per cent coupon bonds, maturing June 1, 1899	3,000 00	
City of Boston four per cent registered bonds, maturing April 1, 1900 . . .	4,000 00	
City of Fall River four cent coupon bonds, maturing Aug. 1, 1900 . . .	13,000 00	
United States four per cent coupon bonds, maturing after July 1, 1907	37,500 00	
Town of Norwalk, Conn., four per cent coupon bonds, maturing at pleasure of town after Jan. 1, 1891	20,000 00	
		215,000 00
Cash balance in First National Bank, Cambridge		730 31
		$427,630 31

RECAPITULATION.

Cambridge Water bonds, bearing six per cent interest	$195,400 00
Cambridge Water bonds, bearing five per interest	12,500 00
Cambridge Low-land Loan bonds, bearing six per cent interest	1,000 00
Cambridge City Loan bonds, bearing six per cent interest	3,000 00
State, city, and town bonds, bearing six per cent interest	1,500 00
State, city, and town bonds, bearing five per cent interest	114,000 00
State, city, and town bonds, bearing four and one half per cent interest . . .	8,000 00
Amount carried forward	$335,400 00

Amount brought forward	$335,400 00	
State, city, and town bonds, bearing four per cent interest	54,000 00	
United States bonds, bearing four per cent interest	37,500 00	
Cash balance in First National Bank, Cambridge	730 31	
		$427,630 31

The bonded water debt, which the foregoing fund is expected to pay, matures as follows, viz.: —

Aug. 1, 1883	$55,000 00
July 2, 1886	100,000 00
April 1, 1887	150,000 00
April 1, 1888	175,000 00
May 1, 1889	112,000 00
July 1, 1890	60,000 00
May 1, 1891	50,000 00
July 1, 1892	335,000 00
April 1, 1894	150,000 00
April 1, 1895	160,000 00
July 1, 1896	103,000 00
July 1, 1897	16,000 00
July 1, 1898	12,500 00
	$1,478,500 00

During the year, $50,000 of the funded Water Loan bonds have matured and been paid, and the fund has increased by $13,061.83.

JAMES A. FOX,
CHARLES WALKER,
WM. W. DALLINGER,
} *Trustees of the Sinking Fund of the Cambridge Water Works.*

CAMBRIDGE WATER BOARD, 1882.

GEORGE P. CARTER . . . . *President.*

Members of Board.

THE MAYOR, PRESIDENT OF COMMON COUNCIL,	*ex officiis.*	
JAMES M. W. HALL,	*term expires*	1886.
KNOWLTON S. CHAFFEE,	" "	1885.
GEORGE P. CARTER,	" "	1884.
HENRY L. EUSTIS,	" "	1883.
CHESTER W. KINGSLEY,	" "	1882.

JUSTIN A. JACOBS, *Clerk.*

HIRAM NEVONS, *Superintendent of Works.*
J. WARREN COTTON, *Water Registrar.*

Trustees of Sinking Fund of Water Loan.

THE MAYOR,
CITY TREASURER,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

SPECIAL ACTS

OF THE

LEGISLATURE OF MASSACHUSETTS.

1837, CHAPTER 160.

An Act to Incorporate the Cambridgeport Aqueduct Company.

Be it enacted, etc., as follows: —

SECTION 1. William Fisk, Aaron Rice and John Skinner, their associates and successors, are hereby made a corporation, by the name of the "Cambridgeport Aqueduct Company," with all the powers and privileges, and subject to all the duties, liabilities and provisions, set forth in the forty-fourth chapter of the Revised Statutes.

SECT. 2. The capital stock of said company shall consist of three hundred shares, and no assessments shall be laid thereon of a greater amount, in the whole, than one hundred dollars on each share.

SECT. 3. The said corporation is hereby authorized and empowered to lay and maintain its pipes, or aqueducts, from the spring or springs of water in land formerly of Jonathan Ireland, at or near Prospect Hill, in Charlestown, through the town of Charlestown and into and through the town of Cambridge, in the county of Middlesex; also, such pipes or aqueducts as the said corporation may deem needful for conveying and distributing said water in Charlestown and Cambridge aforesaid; and to this end may take and hold any lands necessary for laying such aqueducts, and may purchase and hold springs of water and reservoirs, and erect such buildings, and establish and maintain such machinery, as may be necessary to carry into effect the objects of this act; and if the proprietors of lands, which said corporation may take for the purpose of laying pipes or conductors of water, do not agree with said company on the price to be paid therefor, any such proprietor may have the damages assessed in the manner provided in the one hundred and sixteenth chapter of the Revised Statutes; and the said corporation, in all cases where it does not acquire title to land, for the purpose of laying and maintaining such pipes, or to a privilege or easement for that purpose, shall cause a certificate, describing the land so taken, to be signed by the president of said corporation, and recorded in the registry of deeds in said county of Middlesex.

SECT. 4. The said corporation is hereby authorized and empowered to lay and maintain its pipes or aqueducts under or over any railroad, canal, highway or street: *provided*, always, that the same be done in such manner as not to obstruct or impede the passing thereon. And the said corporation, in laying its pipes or aqueducts, through the highways and streets of Charlestown and Cambridge aforesaid, and in repairing the same from time to time, shall not unnecessarily obstruct any highway or street; and in every case of the removal of any earth or pavement, in any such highway or street, the said corporation shall cause the earth to be replaced, and the pavement to be laid anew, so that every such highway or street shall be in as good condition as the same was in before such removal.

SECT. 5. The said pipes and aqueducts shall be so laid and constructed in said Charlestown and Cambridge that water can be drawn therefrom for the extinguishment of fires, and to be used by persons thereto authorized by said respective towns, and free access shall be had thereto for that purpose; and for that purpose each of said towns may at its own cost place all proper and necessary fire-plugs and fixtures upon any pipes or aqueducts of said corporation, at as many different places in the several streets and highways as the selectmen of said towns respectively shall deem needful: *provided*, that the said fire-plugs and fixtures shall not be used for the purpose of drawing water from said pipes for any other use than the extinguishment of fires, and shall be so constructed as to prevent the water in the pipes from running to waste; and the said corporation shall not demand or receive any compensation for water taken for the extinguishment of fires as aforesaid.

SECT. 6. If any person shall wilfully and maliciously defile, corrupt, or make impure any spring or other source of water or reservoir used by said corporation as aforesaid, or destroy or injure any pipe, aqueduct, machinery or other property of said corporation, such person and all who shall aid or abet in such trespass shall forfeit to the use of said company, for every such offence, treble the amount of damages which shall appear on the trial to have been sustained thereby; and may further be punished by a fine not exceeding one thousand dollars, or may be imprisoned for a term not exceeding one year.

SECT. 7. The said corporation is hereby empowered to sell the privilege of using the water which may be conducted as aforesaid to any corporation or person, such contracts to continue for no longer term than three years: *provided*, that no compensation shall be taken for the use thereof for the extinguishment of fires as aforesaid; and the said corporation or its directors may make all reasonable rules and regulations as to the manner and the times in which said water may be taken and used.

SECT. 8. The said corporation shall cause a true and faithful record of its proceedings, and just and accurate accounts to be kept, which record and accounts shall be subject at all times to the inspection of any committee appointed by the General Court; and all officers and agents of said corporation shall be liable to examination on oath by such committee.

[*Approved April* 13, 1837.]

1852, CHAPTER 255.

An Act to Incorporate the Cambridge Water Works.

Be it enacted, etc., as follows: —

SECTION 1. Estes Howe, Gardiner G. Hubbard, Moses M. Rice, their associates and successors, are hereby made a corporation by the name of the Cambridge Water Works, for the purpose of supplying the city of Cambridge with water, with all the powers and privileges and subject to all the duties, restrictions, and liabilities set forth in the thirty-eighth and forty-fourth chapters of the Revised Statutes.

SECT. 2. The city of Cambridge may, at any time during the continuance of the charter hereby granted, purchase the corporate property, and all the rights and privileges of the said corporation, at such price as may be agreed upon between the said parties; and in case of disagreement, the Supreme Judicial Court, upon application by either party, shall be authorized to appoint three commissioners to settle such disagreement.

SECT. 3. The said corporation, with the consent of the mayor and aldermen of the city of Cambridge, shall have power and authority to open the ground in any part of the streets, lanes, and highways in the said city, for the purpose of conducting and distributing water through the said city; and the said corporation, after opening the ground as aforesaid, shall be held to put the same into repair, under the penalty of being prosecuted as a nuisance: *provided*, that the said mayor and aldermen, for the time being, shall at all times have the power to regulate, restrict and control the acts and doings of said corporation, which may in any manner affect the health, safety or convenience of the inhabitants of said city.

SECT. 4. The said corporation may, for the purposes aforesaid, hold real estate not exceeding in value one hundred thousand dollars, and the whole capital stock shall not exceed five hundred thousand dollars.

SECT. 5. This act shall take effect from and after its passage.

[*Approved May* 20, 1852.]

1853, CHAPTER 322.

An Act to Authorize the City of Cambridge to take Stock in the Cambridge Water Works, or to loan Money on Pledge of the Stock of said Company.

Be it enacted, etc., as follows: —

SECTION 1. The city of Cambridge is hereby authorized to subscribe for any portion of the stock of the Cambridge Water Works, and said shares may be paid for in cash or in exchange for bonds of the said corporation, at not less than the par value thereof; or to loan money to the said company, on pledge of their stock.

SECT. 2. This act shall take effect from and after its passage.

[*Approved May* 11, 1853.]

1856, CHAPTER 290.

An Act Concerning the Cambridge Water Works.

Be it enacted, etc., as follows: —

SECTION 1. The Cambridge Water Works are hereby authorized, for the purpose of furnishing the inhabitants of Cambridge with a supply of soft water, to raise the waters of Fresh Pond, by steam power, into a receiving reservoir, and conducting the same by pipes from thence through the city of Cambridge: *provided, however,* that they shall not, at any time, draw the waters of said pond, or of Spy and Little Ponds, below low-water mark of said ponds.

SECT. 2. Said Cambridge Water Works may construct a dam at the outlet of Fresh Pond, at some convenient place near the Concord Avenue, and also a dam on the outlets of Spy and Little Ponds, at some convenient place on the same, near the place where said streams pass under the Lexington Branch Railroad: *provided, however*, that they shall not, at any time, raise the waters of Fresh, Spy or Little Ponds, by means of said dams, so that they shall rise above high-water mark of said ponds.

SECT. 3. A commissioner shall be nominated by the governor and council, on application of said Cambridge Water Works, or of any party in interest, who shall, at the cost and expense of said Water Works, after notice to all parties in interest, ascertain the points between which the waters of said ponds and said brooks rise and fall, and shall erect permanent monuments showing the same, and shall make a full report of all his doings to the governor and council.

SECT. 4. The said Cambridge Water Works may lay pipes, build and maintain aqueducts and reservoirs, for conducting, holding and distributing water, may erect and maintain engine houses, and may construct and maintain any other works necessary for the carrying on the purposes for which they are chartered.

SECT. 5. For the purposes aforesaid, the Cambridge Water Works may take, hold and convey land, water and water-rights: *provided, however*, that before entering upon the lands and water-rights, or taking any water of any person or corporation, they shall file their petition before the Supreme Judicial Court for the county of Suffolk, praying for the appointment of three commissioners, to assess the damages, if any, caused by taking land, water or water-rights; and such commissioners shall have full power, after due notice to each party, to assess the damages, if any, which shall be paid by said Cambridge Water Works; and their determination, or that of the major part of them, being returned into and accepted by said court, shall be final and binding upon both parties, and judgment shall be rendered thereon, unless one of the said parties shall claim a trial by jury, as is hereinafter provided.

SECT. 6. In case either party shall claim a jury trial, as provided in the last section, such party may, at the term at which such award is accepted, or the next term thereafter, claim, in writing, a trial at the bar of said court, and have a jury to hear and determine all questions of fact relating to such damages, and to assess the amount thereof; and in case a greater sum is not awarded than that allowed by said commissioners, such party shall pay the costs in the petition, and the verdict of such jury being accepted and recorded by said court, shall be final and conclusive, and judgment shall be rendered thereon.

SECT. 7. Whenever judgment shall have been rendered for any damages assessed, as before provided, the said Cambridge Water Works shall thereupon pay to the clerk of the court the amount of said judgment, with interest thereon, together with the costs of court taxed by the clerk, which sum shall be in full satisfaction of said judgment; and until it is satisfied, as aforesaid, said Cambridge Water Works shall have no right to enter upon said land, water or water-rights.

SECT. 8. The said Cambridge Water Works shall keep open a good and sufficient way, for the passage of the fish that usually go up into Fresh, Spy and Little Ponds, in their usual and proper season in the year, between the first day of March and last day of June, inclusive: *provided*, such fishway need not be kept open in the spring of the year, before the persons having a right of fishing in said streams, or some one of them, shall have notified the Water Works to open them. And said Water Works, if they do not comply with the provisions of this section, shall forfeit and pay the sum of five hundred dollars for each and every day during which they shall wilfully neglect to comply therewith, to be recovered in an action of tort, to the use of any person or persons who shall suffer therefrom, who shall sue for the same in any court of competent jurisdiction.

SECT. 9. The occupant of any tenement shall be liable for the payment of the price or rent for the use of the water in such tenement, and the owner thereof shall be also liable if, on being notified of such use, he does not object thereto; and if any person or persons shall use any of said water raised as aforesaid, in the city of Cambridge, without the consent of said Water Works, an action of tort may be maintained against him for the recovery of damages therefor.

SECT. 10. If any person or persons shall, wantonly or maliciously, divert the water, or any part thereof, of any of the ponds, streams or water sources which shall be used by the Cambridge Water Works pursuant to the provisions of this act, or shall corrupt the same, or render it impure, or destroy or injure any dam, reservoir, pipe, hydrant, building, machinery or other property held, owned or used by said Cambridge Water Works, by the authority and for the purposes for which they are chartered, every such person or persons shall forfeit and pay to said Water Works three times the amount of the damages that shall be assessed therefor, to be recovered by any proper action. And every such person or persons may, moreover, on indictment and conviction of either of the wanton and malicious acts aforesaid, be punished by fine not exceeding five hundred dollars and imprisonment not exceeding three months: *provided*, that nothing in this section contained shall be construed to prevent the abutters on said pond from entering upon said pond during the winter season, for the purpose of cutting ice, with men and horses, and the proper implements for preparing and cutting the said ice, and securing the same in the manner heretofore practised.

SECT. 11. Nothing in this act contained shall be construed to affect, in any manner, the rights of any party or parties to any suit or proceeding, in law or equity, now pending.

SECT. 12. This act shall not take effect unless the legal voters of the city of Cambridge, at a meeting notified for that purpose, at least thirty days before the day appointed for such meeting, shall, by a majority of the votes cast at such meeting, agree to accept the same.

[*Approved June* 6, 1856.]

1861, CHAPTER 12.

An Act Authorizing the Cambridge Water Works to Purchase the Property and Franchise of the Cambridgeport Aqueduct Company.

Be it enacted, etc., as follows: —

SECTION 1. The Cambridge Water Works are hereby authorized and empowered to purchase of the Cambridgeport Aqueduct Company all their corporate property, both real and personal, together with the franchise thereof, and the Cambridgeport Aqueduct Company are hereby authorized and empowered to sell and transfer all their corporate property, with the franchise thereof, to the said Cambridge Water Works; and when said property shall have been purchased and transferred as aforesaid, all the rights, powers and privileges conferred upon the Cambridgeport Aqueduct Company by their act of incorporation, with all the duties, restrictions, and liabilities imposed by said act, shall be vested in the Cambridge Water Works, as fully and as legally as they now are in the Cambridgeport Aqueduct Company.

SECT. 2. This act shall take effect upon its passage.

[*Approved Jan.* 31, 1861.]

1865, CHAPTER 153.

An Act for Supplying the City of Cambridge with Pure Water.

Be it enacted, etc., as follows: —

SECTION 1. The city of Cambridge, for the purpose of supplying the inhabitants thereof with fresh water, is hereby authorized and empowered to purchase, upon such terms as may be agreed upon, all the works, franchises, rights and property of the Cambridge Water Works, including the works, franchises, rights and property of the Cambridgepo

Aqueduct Company, acquired by said Cambridge Water Works under the provisions of chapter twelve of the acts of the year eighteen hundred and sixty-one, and hold the same, and may enlarge, improve and repair the water sources, aqueducts, pumps, reservoirs and other property so purchased, with a view to an increased and adequate supply of pure water for public and private uses in said city, subject to the restrictions now imposed by law upon the Cambridge Water Works; and may also take and hold, in like manner, such land as may be necessary for erecting and maintaining dams and reservoirs, and for erecting and maintaining conduits, pipes and other works for collecting, conducting and distributing water from the sources of supply now used by said Cambridge Water Works through said city, or from the sources of supply which said Cambridge Water Works have the right to use. The Cambridge Water Works are hereby authorized and empowered to sell and transfer all their corporate property, rights and franchise to the said city of Cambridge.

SECT. 2. The mayor of said city, within thirty days after the taking of any land or other property, under the provisions of this act, shall file in the registry of deeds for the county of Middlesex a description thereof sufficiently accurate for identification.

SECT. 3. Said city, for the purposes aforesaid, may build aqueducts and maintain the same, by any works suitable therefor; may erect and maintain dams; may make and maintain suitable reservoirs; may make and establish such public fountains and hydrants as may from time to time be deemed proper, and may change or discontinue the same; may regulate the use of the water, and establish the prices or rents to be paid therefor, and collect the same by process of law. Said city may also, for the purposes aforesaid, carry its pipes and drains over or under any water-course, street, railroad, highway or other way, in such manner as not to obstruct the same; and may enter upon and dig up such road, street or way, for the purpose of laying down, maintaining or repairing pipes or drains, and may do any other acts or things necessary and proper in executing the purposes of this act.

SECT. 4. If said city enters upon and digs up, for the purposes aforesaid, any road, street or way without its own limits, it shall do so under the direction of the selectmen of the town in which said road, street or way is located, and shall restore said road, street or way to as good order and condition as it was in before such digging was commenced; and the work shall be done in such manner and with such care as not to render any road, street or way in which such pipes are laid, unsafe or unnecessarily inconvenient to the public travel thereon. Said city shall at all times indemnify and save harmless such town which is liable to keep in repair any road, street or way aforesaid, against all damages which may be recovered against it, and shall reimburse to it all expenses which it shall reasonably incur by reason of any defect or want of repair in such road, street or way, caused by the maintenance, repairing or replacing of said pipes, or by reason of any injury to persons or property caused by any defect or want of repair in such pipes; *provided*, that said city has notice of any claim or suit for such damage or injury, and an opportunity to assume the defence thereof.

SECT. 5. Said city shall be liable to pay all damages sustained by any persons or corporations by the taking of any land or property, or by the constructing of any aqueducts, reservoirs or other works, for the purposes aforesaid. If any person or corporation, sustaining damages as aforesaid, cannot agree with said city upon the amount of said damages, he may have them assessed in the same manner as is provided by law with respect to land taken for highways.

SECT. 6. All the rights, powers and authority given to the city of Cambridge by this act shall be exercised by said city, subject to all duties, liabilities and restrictions herein contained, in such manner and by such agents, officers and servants as the City Council shall from time to time ordain, direct and appoint.

SECT. 7. For the purpose of defraying the cost of such franchises, property, lands, water and water-rights as are purchased, taken or held for the purposes aforesaid, and of constructing the works necessary and proper for the accomplishment of said purposes, and paying all expenses incident thereto, the City Council shall have authority to issue scrip or bonds, to be denominated on the face thereof "Cambridge Water Loan," to an amount not exceeding in the whole five hundred thousand dollars, bearing interest not exceeding six per centum per annum, payable semi-annually, and the principal to be payable at periods not more than fifty years from the issuing of such scrip or bonds, respectively. Said City Council may sell the same or any part thereof, from time to time, or pledge the same for money borrowed for the above purposes; but the same shall not be sold or pledged for less than the par value thereof. Said scrip or bonds may be paid at the par value thereof, for the purchase of the property mentioned in section one of this act.

SECT. 8. The City Council shall establish such price or rents to be paid for the use of the water as to provide annually, if practicable, from the net income and receipts therefor, for the payment of the interest and not less than one per centum of the principal of the "Cambridge Water Loan," and shall determine the manner of collecting the same. The net surplus income and receipts, after deducting all expenses and charges of distribution, shall be set apart as a sinking fund, and applied solely to the payment of the principal and interest of said loan, until the same is fully paid. The mayor, city treasurer and president of the Common Council, for the time being, shall be trustees of said fund, and shall, whenever required by the City Council, render an account of all their doings in relation thereto.

SECT. 9. The occupant of any tenement shall be liable for the payment of the rent for the use of the water in such tenement, and the owner thereof shall be also liable, if, on being notified of such use, he does not object to the same.

SECT. 10. If any person shall use any of the said water, either within or without said city, without the consent of the same, an action of tort may be maintained by said city for the recovery of the damages sustained.

SECT. 11. Whoever wantonly or maliciously diverts the water, or any part thereof, taken or held by said city pursuant to the provisions of this act, or corrupts the same, or renders it impure, or destroys or injures any dam, aqueduct, pipe, conduit, hydrant or machinery, or other works or property held, owned or used by said city under the authority and for the purposes of this act, shall forfeit and pay to said city three times the amount of the damages assessed therefor, to be recovered in an action of tort; and on conviction of either of the wanton or malicious acts aforesaid, may also be punished by fine not exceeding three hundred dollars, or by imprisonment not exceeding one year in the house of correction in said county of Middlesex.

SECT. 12. This act shall take effect upon its passage.

[*Approved April* 25, 1865.]

1866, CHAPTER 89.

An Act to Amend an Act for Supplying the City of Cambridge with Pure Water.

Be it enacted, etc., as follows: —

SECTION 1. The seventh section of chapter one hundred and fifty-three of the acts of the year eighteen hundred and sixty-five is hereby amended as follows: The City Council of the city of Cambridge shall have authority to sell the scrip or bonds specified in said section, or any part thereof, from time to time, or pledge the same for money borrowed for the purposes named in said section, on such terms and conditions as the said City Council shall judge proper.

SECT. 2. This act shall take effect upon its passage.

[*Approved March* 21, 1866.]

1868, CHAPTER 13.

An Act in Addition to an Act to Supply the City of Cambridge with Pure Water.

Be it enacted, etc., as follows: —

SECTION 1. For the purpose of extending and enlarging the Cambridge Water Works, the City Council of the city of Cambridge shall have authority to issue scrip or bonds, in addition to the scrip or bonds the issue of which was authorized by chapter one hundred and fifty-three of the acts of eighteen hundred and sixty-five, to an amount not exceeding five hundred thousand dollars, bearing interest not exceeding six per centum per annum, payable semi-annually, and the principal to be payable at periods not more than fifty years from the issuing of said scrip or bonds; and said City Council shall have authority to sell said scrip or bonds or any part thereof, from time to time, or pledge the same for money borrowed for the extension of said water works, on such terms and conditions as the said City Council shall judge proper.

SECT. 2. This act shall take effect upon its passage.

[*Approved Feb.* 17, 1868.]

1872, CHAPTER 157.

An Act in Addition to an Act to Supply the City of Cambridge with Pure Water.

Be it enacted etc., as follows: —

SECTION 1. To enlarge and extend the water works of the city of Cambridge, the City Council of said city may issue scrip or bonds in addition to the scrip or bonds authorized by chapter thirteen of the acts of the year eighteen hundred and sixty-eight, to an amount not exceeding five hundred thousand dollars, bearing interest not exceeding six per centum per annum, payable semi-annually, the principal to be payable at periods not more than fifty years from the issuing of such scrip or bonds; and said City Council may sell such scrip or bonds, or any part thereof, from time to time, or pledge the same for money borrowed for the extension of said water works, on such terms and conditions as it may deem proper.

SECT. 2. This act shall take effect upon its passage.

[*Approved March* 28, 1872.]

1875, CHAPTER 145.

An Act in Addition to an Act to Supply the City of Cambridge with Pure Water.

Be it enacted, etc., as follows: —

SECTION 1. To enlarge and extend the water works of the city of Cambridge, the City Council of said city may issue scrip or bonds in addition to the scrip or bonds authorized by chapter one hundred fifty-seven of the acts of the year eighteen hundred seventy-two, to an amount not exceeding five hundred thousand dollars, bearing interest not exceeding six per centum per annum, payable semi-annually, the principal to be payable at periods not more than twenty years from the issuing of such scrip or bonds; and said City Council may sell such scrip or bonds, or any part thereof, from time to time, or pledge the same for money borrowed for the extension of said water works, on such terms and conditions as it may deem proper.

SECT. 2. Said city of Cambridge shall annually set apart from the surplus receipts of said works, after deducting all expenses and charges of distribution, and if that should be insufficient, from money raised by taxation for the sinking fund now established for the redemption of its water bonds, a sum not less than three per centum of the par value of the then outstanding water bonds.

SECT. 3. This act shall take effect upon its passage.

[*Approved April* 20, 1875.]

1875, CHAPTER 165.

An Act to Provide a Further Supply of Water for the City of Cambridge.

Be it enacted, etc., as follows: —

SECTION 1. The city of Cambridge, for the purpose of supplying said city and the inhabitants thereof with pure water for the extinguishment of fires, for domestic and other purposes, may take, hold and convey into and through said city the waters of Spy Pond, in the town of Arlington, and of Little Pond, in the town of Belmont, and of Wellington Brook, in said Belmont, and the waters that flow into said ponds or brook, or either of them; may connect the same or any part thereof with Fresh Pond; and may take and hold by purchase or otherwise such land on and around the margin of said ponds, including Fresh Pond, not exceeding five rods in width, as may be necessary for the preservation and purity of said waters, and may also take and hold in like manner such lands as may be necessary for erecting and maintaining dams and reservoirs, and for laying and maintaining conduits, pipes, drains and other works for collecting, conducting and distributing said waters into and through said city either by the way of Fresh Pond or otherwise: *provided, however*, that said city shall not hereby acquire any right to take ice from either of said ponds, or to take land upon which any building or machinery is now erected, or which is used in connection with such building or machinery for the purpose of storing ice or for convenience in cutting, storing and moving ice, without the consent of the owner of said land and buildings or machinery, and shall not obstruct by ditches, buildings or other structures the rights of such owners in the cutting, storing and moving of ice, except so far as the same shall result from the raising or lowering of the surface of the water of said ponds or either of them, and except so far as is necessary for the preservation of the purity of the waters of said ponds; but nothing in this act shall be construed to give additional rights to said city to lower the surface of said Fresh Pond below the point now authorized by law.

SECT. 2. Said city, by its mayor, shall, within sixty days after taking any lands for the purposes of this act, file in the registry of deeds of the county and district in which such land lies, a description of the land so taken as certain as is required in a common conveyance of land.

SECT. 3. Said city, for the purposes aforesaid, may build aqueducts, and maintain the same by any works suitable therefor; may erect and maintain dams; may make and maintain suitable reservoirs; may make and establish such public fountains and hydrants as may from time to time be deemed proper, and may change or discontinue the same; may regulate the use of water, and establish the price or rents to be paid therefor, and collect the same by process of law. Said city may also, for the purposes aforesaid, carry its pipes and drains over or under any water-course, street, railroad, highway or other way, in such manner as not to obstruct the same; and may enter upon and dig up such road, street or way, for the purpose of laying down, maintaining or repairing pipes or drains, and may do any other things necessary and proper in executing the purposes of this act.

SECT. 4. If said city enters upon and digs up, for the purposes aforesaid, any road, street or way which is outside of the limits of said city, it shall do so under the direction of the selectmen of the town in which said road, street or way is located, and shall restore said road, street or way to as good order and condition as it was in before such digging was commenced; and the work shall be done in such manner, and with such care, as not to render any road, street or way in which such pipes are laid unsafe, or unnecessarily inconvenient to the public travel thereon. Said city shall at all times indemnify and save harmless any such town which is liable to keep in repair any road, street or way aforesaid, against all damages which may be recovered against it, and shall reimburse to it all expense which it shall reasonably incur by reason of any defect or want of repair in such road, street or way caused by the maintenance, repairing or replacing of said pipes, or by reason of any injury to persons or property caused by any defect or want of repair in any such pipes: *provided*, that said city has notice of any claim or suit for such damage or injury, and an opportunity to assume the defence thereof.

SECT. 5. Said city shall be liable to pay all damages sustained by any persons or corporations by the taking of, or injury to any of their land, water, water-rights, rights of way or property, or by the constructing of any aqueduct, reservoir or other works for the purposes aforesaid. If any person or corporation, sustaining damages as aforesaid, cannot agree with said city upon the amount of said damages, he may within three years from such taking or construction have them assessed in the same manner as is provided by law with respect to land taken for highways.

SECT. 6. All the rights, powers and authority given to the city of Cambridge by this act shall be exercised by said city, subject to all duties, liabilities and restrictions herein contained, in such manner and by such agents, officers and servants, as the City Council shall from time to time ordain, direct and appoint.

SECT. 7. Whoever wantonly or maliciously diverts the water, or any part thereof, taken or held by said city pursuant to the provisions of this act, or corrupts the same, or renders it impure, or destroys or injures any dam, aqueduct, pipe, conduit, hydrant, machinery or other works or property held, owned or used by said city under the authority and for the purposes of this act, shall forfeit and pay to said city three times the amount of the damages assessed therefor, to be recovered in an action of tort; and on conviction of either of the wanton or malicious acts aforesaid, may also be punished by fine not exceeding three hundred dollars, or by imprisonment not exceeding one year in the house of corrrection in said county of Middlesex.

SECT. 8. This act shall take effect upon its passage.

[*Approved May* 1, 1875.]

1880, CHAPTER 126.

An Act in Addition to the Acts for the Purpose of Supplying the City of Boston with Pure Water.

Be it enacted, etc., as follows: —

SECTION 1. For the purpose of supplying water to its inhabitants, the city of Boston is hereby authorized, by and through the agency of the Boston Water Board. to lay and maintain new main pipes from its reservoir, constructed under the provisions of chapter one hundred and thirty-one of the acts of the year eighteen hundred and sixty-five, through the town of Brookline, to the city of Boston, in the manner provided in chapter one hundred and sixty-seven of the acts of the year eighteen hundred and forty-six; and for this purpose may take and hold, by purchase or otherwise, any lands or real estate necessary therefor; and lay said pipes over or under any water-course, or any streets, turnpike roads, railroads, highways or other ways, in such manner as not to unnecessarily obstruct or impede the travel thereon; and may enter upon and dig up any such roads, streets or ways, for the purpose of laying down said pipes beneath the surface thereof, and for maintaining and repairing the same: but always in such manner and with such care as not to render the roads, streets and ways unnecessarily unsafe or inconvenient to the public travel thereon. And said city of Boston, in performing said work, shall be subject to such reasonable regulations as to time, place and manner of digging up any streets or ways of public travel, for the purposes aforesaid and the laying of said pipes, as shall be made by the selectmen of Brookline, within the limits of said town, for the protection of their rights of drainage and sewerage therein and the public rights of passage thereon.

SECT. 2. For the purpose aforesaid the city of Boston is likewise authorized, through the agency of the Boston Water Board, to lay and maintain a main pipe from any point on pipes authorized by the foregoing section through the cities of Cambridge and Somerville, and the towns of Brookline and Medford, to the Mystic pumping station, so called, in the city of Somerville; and for this purpose shall have all the powers specified in the foregoing section, and shall be subject to such reasonable regulations of the city councils of the cities of Cambridge and Somerville. and the selectmen of the towns of Medford and Brookline, within their respective limits, as may by the foregoing section be made by the selectmen of the town of Brookline. Said city of Boston shall not displace any public sewer or water pipe, without the assent of the said city councils and boards of selectmen, respectively.

SECT. 3. Whenever the city of Boston shall dig up any street or way as aforesaid, it shall restore the same to as good order and condition as the same shall be in when such digging commenced; and the city of Boston shall at all times indemnify and save harmless the cities of Cambridge and Somerville, and the towns of Medford and Brookline, against all damage which may be recovered against them respectively; and shall reimburse to them respectively, all expenses which they shall incur by reason of any defect or want of repair in any street or way, caused by the construction of said aqueduct or the laying of said pipes, or by the maintaining or repairing of the same: *provided*, that the city of Boston shall have due and reasonable notice of all claims for such damages or injury, and opportunity to make a legal defence thereto.

SECT. 4. The city of Boston shall be liable to pay all damages that shall be sustained by any persons in their property, by the taking of any land or real estate, or the laying of said pipes, as aforesaid; and any person sustaining damage, as aforesaid, may have the same ascertained, determined, collected and paid in the manner which is provided in sections six, seven and eight of chapter one hundred and sixty-seven of the acts of the year eighteen hundred and forty-six.

SECT. 5. Upon requisition by the respective city councils of the cities of Cambridge and Somerville, and the respective boards of selectmen of the towns of Medford and Brookline, prior to the laying of the said aqueduct and pipes through their respective limits, the city of Boston shall insert a number of hydrants in said pipes, at points not less than one thousand feet apart, to be used for extinguishing fires, free of charge, and for no other purpose; and said several cities and towns shall pay to the city of Boston the expense of inserting and keeping in repair such hydrants as shall have been so inserted upon their requisitions aforesaid, within their respective limits.

SECT. 6. The city of Boston is also authorized, if the Boston Water Board shall be of opinion that the supply of water is sufficient for the purpose, to sell water to the city of Cambridge, when conducted through the main pipes laid by virtue of the provisions of section two of this act, upon such terms as may be agreed upon by the City Council of the city of Cambridge, and said Boston Water Board.

SECT. 7. This act shall take effect upon its acceptance by the City Council of the city of Boston; but the powers conferred by section one of this act may be exercised without any obligation on the part of said city to exercise the powers conferred by section two.

[*Approved March* 19, 1880.]

1880, CHAPTER 171.

An Act to Amend Chapter One Hundred and Sixty-five of the Acts of the Year Eighteen Hundred and Seventy-five, relating to a Further Supply of Water for the City of Cambridge.

Be it enacted, etc., as follows: —

SECTION 1. So much of chapter one hundred and sixty-five of the acts of the year eighteen hundred and seventy-five as authorizes the city of Cambridge to take such land around the margin of Spy Pond, not exceeding five rods in width, as may be necessary for the preservation and purity of the water of said pond, is hereby repealed: *provided, however*, that this act shall not affect any right already accrued under any former taking of land upon the margin of said pond under said act; and *provided, further*, that this act shall not in any way affect any other provisions of the said act.

SECT. 2. This act shall take effect upon its passage.

[*Approved April* 7, 1870.]

City of Cambridge.

THE

EIGHTEENTH ANNUAL REPORT

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL,

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS,

FOR THE YEAR 1882.

CAMBRIDGE:
TRIBUNE PUBLISHING COMPANY.
1883.

City of Cambridge.

32037

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☆ CAMBRIDGE PUB. LBRY

REPORT

OF THE

CAMBRIDGE WATER BOARD

FOR 1882.

To the Honorable City Council of the City of Cambridge: —

IN accordance with the requirement of the city ordinance, the Cambridge Water Board herewith submits to you its eighteenth annual report.

Total Cost of the Works.

Cost of the Water Works, Nov. 30, 1881, as per last year's report	$1,728,655 35
Expended on construction account during the year ending Nov. 30, 1882	16,959 12
Making the total expenditure	$1,745,614 47

Water Bond Account.

Whole amount of bonds issued	$1,714,900 00
Less amount paid from the Water Loan Sinking Fund	236,400 00
Leaving unpaid water loan	$1,478,500 00
Deduct from this the value of the Water Loan Sinking Fund, as per the Trustees' account	483,137 81
Leaving amount yet to be provided by the Sinking Fund to extinguish the balance of the water loan	$995,362 19

Statement showing in brief the transactions on account of the water works for the year ending Nov. 30, 1882.

Received.

From water rates	$178,729 82	
Less water rates refunded	1,299 02	
		$177,430 80
Shutting off and letting on water, and fines		610 35
Rent of house		144 00
From supply account		3,832 51
Balance, showing loss in 1882		436 15
		$182,453 81

Expended.

For construction account, 13 months	$16,959 12
For maintenance account, 13 months	28,870 06
For supply account, 13 months	3,684 63
Interest on water loan	88,585 00
Paid into the Sinking Fund	44,355 00
	$182,453 81

Comparative Receipts.

Water rates for the year ending Nov. 30, 1882	$177,430 80
Water rates for the year ending Nov. 30, 1881	170,062 73
Showing gain in the year 1882	$7,368 07

We would call attention to the fact that this year's accounts show the amount of water loan outstanding, less the Water Loan Sinking Fund, to be less than one million dollars, and also that there is a steady increase in the receipts of the annual water rates.

Water Supply.

The total amount of water pumped during the year was 903,234,909 gallons, being a daily average of 2,474,616 gallons. In 1881 the total amount pumped was 902,319,300 gallons, the daily average being 2,472,108 gallons, showing the increased amount pumped in 1882 over 1881 to be only 915,609 gallons.

In these days, when we hear so much from other places in regard to waste of water, and the best means to prevent it, we wish to call your particular attention to these figures, as showing the excellent condition and comparative economy of our water works in this respect.

The total amount of water pumped as above, 903,234,909, shows a daily average for each inhabitant of about 44.19 gallons, estimated on a population of 56,000.

If we now take the whole number of gallons	903,234,909
And deduct from this the amount sold by meter, and used in watering the streets, say.	233,497,905
We have left for domestic use	669,737,004
Showing the daily average for each inhabitant for domestic purposes to be about	32.7

This is an improvement on our excellent record of last year, when the total average per inhabitant we made 46.75 gallons, and the amount for each one, for domestic purposes, 36 gallons. For the purpose of comparison we append the daily average of other cities, taken from their reports.

Daily consumption per inhabitant of other cities, taken from their reports and other sources.

	Gallons.		Gallons.
Pittsburg	100	Cincinnati	53
Toledo	65	Erie	72
New York	90	Baltimore	50
Detroit	88	Lowell	44
Minneapolis	64	St. Louis	44
Patterson	117	Augusta	104
Chicago	80	Poughkeepsie	69
Nashville	138	Meriden	54
Quebec	60	Jersey City	83
Hartford	80	Cleveland	43
Reading	75	Allentown	55
Wilmington	83	Binghamton	98
New Haven	75	Washington	127
Albany	70	Worcester	48
Lawrence	47	New Bedford	75
Springfield	66	Nashua	74
Salem	61	Kalamazoo	67
Buffalo	63	Saratoga	108
Denver	59	Des Moines	57
Boston	60	Auburn	118
Memphis	148	East Saginaw	83
Philadelphia	56	Sandusky	81
Savannah	78	Lockport	59
Peoria	68	Cambridge	44

The water in the pond, Dec. 1, 1881, was two feet five and seven eighths inches above the top of the conduit. On Dec. 1, 1882, it stood one foot eight and one half inches above the top of the conduit, showing a loss of about one foot this year, compared with last year.

The water in the pond reached its highest point March 28, being then six feet ten and one half inches above the conduit. This was about two inches lower than the highest point reached in 1881.

We give our usual statement showing the comparative rainfall and height of water in the pond during the year, compared with the two preceding years.

MONTHS.	RAINFALL.			BELOW HIGH-WATER MARK.		
	1880.	1881.	1882.	1880.	1881.	1882.
	Inches.	Inches.	Inches.	Feet.	Feet.	Feet.
December, 1881.................	3.76	1.98	3.80	4.87	8.52	5.48
January, 1882.................	2.62	5.03	4.73	4.87	8.56	5.48
February, "	3.49	4.14	4.48	4.60	8.20	4.27
March, "	2.85	6.07	2.49	4.14	2.65	1.32
April, "	1.94	1.83	2.27	3.90	0.98	1.24
May, "	1.44	3.62	4.93	4.44	1.26	1.64
June, "	0.73	6.27	2.73	5.38	1.72	2.08
July, "	6.49	3.41	2.08	6.29	2.36	3.04
August, "	3.48	1.13	1.41	6.79	3.24	4.32
September, "	1.63	2.74	7.30	7.46	4.07	5.09
October, "	2.63	2.85	2.19	8.03	4.87	5.32
November, "	2.25	4.68	1.21	8.33	5.23	5.90
Total for the year............	33.31	42.85	39.62	Av. 5.76	Av. 4.30	Av. 3.77

Purity of the Water.

The analyses made during the year have not shown any material change in the water, and no complaints have come to us in regard to the quality of the water except those of a local nature, which are soon removed.

There is one source of impurity which affects our water every year, and which the analysis plainly shows. On the southwesterly side of the pond there is a piece of swamp land comprising some acres. This land is overflowed when the pond is partly full, but nearly bare at very low water; it is covered with a heavy growth of vegetable matter every year. In the fall of the year the leaves and grass fall into the water and are floated over in large quantities against our conduit and the eastern shore, in a decaying condition. At a very moderate expense an embankment might be made which would effectually prevent any of this matter that was in suspense in the water from floating into and across the pond, and only such of it would come into the pond from this source as might be in solution after it had filtered through the embankment to be thrown up as suggested. In this way this trouble might be easily removed. The water is low in the pond now, the material is near that will be required to do the job, and it might be done to advantage this winter, giving work to some of our citizens who will very much need it.

Leakage and Waste.

Our system of thorough inspection of the fixtures on the premises of the water-takers, in connection with sectional night examinations of the street pipes, has been continued, with most satisfactory results. During the year 152 leaks have been found and stopped, 31 on main pipes, 56 on supply pipes, and 65 on the premises of the water-takers. The good results of this work and the sound condition of the pipes in regard to leakage are demonstrated by the registering of the chronograph at the reservoir in the night between 12 and 4 A. M., a recent record showing the fall in the reservoir during these hours to be only $3\frac{58}{100}$ inches, which is equal to 28,668 gallons per hour, as against 34,293 gallons per hour last year. This amount of water necessarily represents all the night consumption, leakage, and waste. When we remember that the railroads, some of our manufactories, and other industries use water during the night always, that we have about 90 miles of main pipes in the streets, from which are taken 7,724 supplies, and that connected with these supplies there are more than 28,600 openings, we think it will be seen that in respect to leakage and waste we are very near, if we have not already reached, the practicable minimum. This favorable condition we believe to be largely due to the constant care and attention of our superintendent, who, with the board, believes in this system of saving water.

High Service.

The high-service system adopted last year by this board for those who lived on the highest lands in our city, who are above our reservoir, and at best could get only a partial supply by means of storage tanks in their houses, has been completed in accordance with plans which we set forth in detail in our last annual report. The work was commenced early in the spring and was put in operation June 10th last, and has since that time been in perfect working order, accomplishing all that was expected, and giving entire satisfaction to all those who are benefited by it. Without in any way interfering with our present system, it completely meets all the needs of the high places in Cambridge. Not only has it removed the just cause of complaint from those who so long suffered for want of an adequate supply of water, but it has also shown us how, in the future, when, by the increased consumption of the city, the head is drawn down so as to affect other high lands and places in Cambridge, and the supply becomes irregular and insufficient, we can then extend this system to these sections and supply them. By so doing we shall put off the necessity of purchasing another large pump for several years, by deferring the time when it will be necessary to run two large pumps to supply the wants of the city. In this view alone we believe this to have been a wise and economical expenditure.

Additional Water Supply.

Our efforts last winter to get the right to take the water of Shawsheen River for an additional supply were not successful. There was a strong opposition from Andover and the city of Boston. In regard to Andover and her mill rights, we think it was conclusively shown that it would be a positive advantage to her water power on the river to grant Cambridge all she asked for, as a large reservoir for the storage of water would be built, of which the water power of the river could have the use and advantage in dry times, when Cambridge would not need it, as Cambridge, having so large a place as Fresh Pond to store water in for her use, could always draw from the Shawsheen to fill Fresh Pond when the river was running more than its average volume of water. It was also argued that Boston already had an ample, and, if properly used, abundant supply for her own use and also to supply Cambridge any that she might want in the future, and therefore Cambridge should first apply to Boston before asking for Shawsheen. We failed to see the force of this position when Boston was asking for this same source of supply to re-enforce her Mystic works, but, that this might not stand in our way in any further efforts to get a supply, an application was made to the city of Boston by a committee appointed by the City Council to learn if the city of Boston could and would supply the future wants of Cambridge for water, and upon what terms.

We do not learn that anything has been accomplished in this direction, nor yet do we see how Boston can, with her own large and rapidly increasing population, supply to Cambridge water for her future wants. Boston has been for the past two years asking the Legislature for the right to take water from the Shawsheen River to re-enforce her Mystic works. During the present year the Boston Water Board sounded the alarm on account of her water supply running low, the use of hose was suspended and other steps taken to reduce the consumption as much as possible.

There would be a serious objection to Cambridge getting a water supply from Boston if she could furnish it, if it was to come from the Cochituate system, on account of the quality of the water. Judging from the experience of the last few years, we do not not think that the Cochituate water would be acceptable to the people of Cambridge.

We do not know of any other source of water supply for Cambridge within a reasonable distance and that can be got at a moderate cost. We cannot blame Boston for wishing to get an additional supply of good, soft, pure water from the Shawsheen for her Mystic works. Seeing no other feasible way to get a supply, we therefore recommend that every proper effort be made either by Cambridge alone, or in connection with Boston, as may be deemed best, until we secure from the Legislature the right to take water from Shawsheen River as an additional water supply.

General Remarks.

A considerable amount of work has been done this year in relaying pipes in the filled district; the old pipes had become buried so deep that it was difficult and expensive to make repairs; many of the pipes were decayed and leaky, and were so deep that it would cost more than they were worth to dig them up. Therefore most of this district had to be newly piped and furnished with new supplies. For details of the work done during the year and many other items of interest, we would refer you to the reports of the superintendent and registrar made to this board, and herewith submitted as part of our report to you.

All departments of the water works are in good order and well manned; all necessary work is well and promptly done.

The growth of our works is shown in the fact that during the year two hundred and one new supplies have been put in. There are but few vacant houses, or places where the water is shut off or sealed.

We would suggest that something more should be done, by setting out shrubbery and otherwise, to improve and beautify Tudor Park, so that no question may properly be raised in regard to the city's complying with the conditions upon which the land was given to the city for the purpose of a park.

We do not anticipate any large expenditure on construction account the ensuing year. There will always be some things that will have to be done, such as repairs on the reservoir, which should be made next year, the improvement of the borders of the pond as herein elsewhere suggested, to preserve and improve the quality of our water, and other things of a similar nature which come in as the usual routine of care and repair.

All that seems to be now needed to complete our water works and put them in such condition as that they would be second to none, is a reliable additional supply of pure, soft water, and until this is procured we shall be constantly liable to a season of short supply and threatened with water famine.

Our city presents unusual inducements to manufacturing interests to locate in our borders, along our water front, and with the large increase of population which is coming, and must continue to come to us, sound judgment plainly indicates that we must have a larger and more reliable supply of water.

GEORGE P. CARTER, C. W. KINGSLEY, JAS. M. W. HALL, H. L. EUSTIS, K. S. CHAFFEE, JAMES A. FOX, GEO. H. HOWARD,	*Water Board.*

REPORT

OF THE

WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, Dec. 9, 1882.

To the Cambridge Water Board: —

THE undersigned herewith presents his seventh annual report, showing the receipts, expenditures, and abatements for the year ending Nov. 30, 1882, together with a statement of the number of water-takers, fixtures, etc., as required by city ordinance.

Amount of bills remaining unpaid Nov. 30, 1881: —		
Water rates	$423 17	
Meter rates	95 64	
Supplies and repairs	580 12	
		$1,098 93
Amount of bills placed in hands of City Treasurer for collection from Dec. 1, 1881, to Dec. 1, 1882: —		
Water rates	$146,864 66	
Meter rates	35,013 55	
Supplies and repairs	4,264 07	
Off and on water, seals, fines, and rent	754 35	
		186,896 63
Total		$187,995 56

Deduct.	Abated.	Unpaid.	
Water rates	$3,398 49	$109 15	
Meter rates	121 38	38 18	
Supplies and repairs	9 42	1,002 26	
	$3,529 29	$1,149 59	4,678 88
Balance			$183,316 68
Amount reported by City Treasurer as received by him			$183,316 68

Receipts.

Water rates	$143,780 19	
Meter rates	34,949 63	$178,729 82
Off and on water, seals, and fines	$610 35	
Rent of house at pipe yard	144 00	
		754 35
Total rates, fines, etc.		$179,484 17
Supplies and repairs		3,832 51
Total		$183,316 68

Expenditures.

Construction account, 13 months		$16,959 12
Supply account, 13 months		3,684 63
Maintenance account, 13 months, viz.: —		
Care and repairs	$13,684 84	
Pumping service	9,441 50	
Office expenses	5,743 72	
		28,870 06
Total		$49,513 81

Abatements.

Abatements of water rates have been made during the year to the amount of	$3,519 87
Abatements on supply and repair account	9 42
Total	$3,529 29

The above amount of abatements is mostly caused by the necessary abatement of all charges for water rates upon supplies shut off or fixtures sealed before the books can be balanced. New charges are then made when the water is again let on.

Refunds.

Water rates have been refunded to the amount of	$1,299 02
Which amount deducted from receipts	178,729 82
Leaves net receipts for water	$177,430 80
Add off and on, seals, fines, and rent	754 35
Makes net receipts of rates, fines, etc.	$178,185 15

Unpaid.

Water rates unpaid, Nov. 30, 1882	$109 15
Meter rates unpaid, Nov. 30, 1882	38 18
Supplies and repairs unpaid, Nov. 30, 1882 . . . . . . :	1,002 26
Total	$1,149 59

Off and On.

Water has been shut off for non-payment of rates, or per order, on account of vacancy, and seals have been applied to fixtures by request of owners or occupants, as follows: —

Supplies shut off in 1882	387
Supplies let on, shut off in 1882	304
Supplies let on, shut off in previous years	73
New supplies let on	186
Seal locks applied to fixtures in 1882.	467
Seal locks removed, put on in 1882	174
Seal locks removed, put on in previous years	171

Statement of the yearly revenue received from water rates since the purchase of the works by the city.

From	April 28, 1865,	to	Dec. 1, 1865	$32,367 19
"	Dec. 1, 1865,	"	1, 1866	40,073 27
"	" 1, 1866,	"	1, 1867	52,733 62
"	" 1, 1867,	"	1, 1868	63,747 42
"	" 1, 1868,	"	1, 1869	76,149 30
"	" 1, 1869,	"	1, 1870	92,606 95
"	" 1, 1870,	"	1, 1871	111,782 65
"	" 1, 1871,	"	1, 1872	127,201 30
"	" 1, 1872,	"	1, 1873	146,117 32
"	" 1, 1873,	"	1, 1874	153,634 27
"	" 1, 1874,	"	1, 1875	138,880 37
"	" 1, 1875,	"	1, 1876	179,166 76
"	" 1, 1876,	"	1, 1877	154,843 59
"	" 1, 1877,	"	1, 1878	157,443 91
"	" 1, 1878,	"	1, 1879	164,681 90
"	" 1, 1879,	"	1, 1880	173,325 49
"	" 1, 1880,	"	1, 1881	170,062 73
"	" 1, 1881,	"	1, 1882	177,430 80

Comparative Statement.

	1881.		1882.	
Construction Account.				
Received				
Expended	....	$6,824 81	....	$16,959 12
Supply Account.				
Received	....	$3,710 78	....	$3 832 51
Expended	....	2,928 68	....	3,684 63
Excess of Receipts	....	$782 10	....	$147 88
Maintenance Account.				
RECEIVED.				
Rates, Fines, etc.	....	$170,897 23	....	$178,185 15
Collected for error on C. and R. bill	....	....	....	5 92
				$178,191 07
EXPENDED.				
Care and Repairs	$23,833 89	....	$28,870 06	
Interest on Water Debt	91,585 00	....	88,585 00	
Paid to Sinking Fund Commissioners	45,855 00	161.273 89	44,355 00	161,810 06
Excess of Receipts	....	$9,623 34	....	$16,381 01
Supply Account, Excess of Receipts		$782 10	....	$147 88
Maintenance Account, Excess of Receipts		9,623 34	....	16,381 01
		$10,405 44	....	$16,528 89
Deduct Expended on Construction Account		6,824 81		
Excess of Total Receipts over Total Expenses		$3,580 63		
Expended on Construction Account				$16,959 12
Deduct Surplus as above				16,528 99
Excess of Total Expenditures over Total Receipts				$430 23

Net surplus, Nov. 30, 1881	$3,580 63
Less deficiency, Nov. 30, 1882	430 23
Leaving balance due water works	$3,150 40

The above is the amount accrued since the report of unexpended balances to Nov. 30, 1880, which is now in the Auditor's hands for examination.

Besides the manufactories, etc., supplied by meter, water is now supplied to 11,249 families, 818 stables, with 2,159 horses and 257 cows, 241 shops, 309 stores and offices, by the following fixtures, viz.: —

13,817 faucets.
3,746 wash-basins.
2,224 wash-tubs.
2,003 bath-tubs.
5,077 pan-closets.
794 slop-closets.
26 hopper closets.
66 urinals.
66 yard hydrants.
5 fountains.
3 tumbler washers.
956 hand hose.

Also, —

582 fire hydrants (besides 4 on private premises).
14 fire reservoirs.
15 drinking fountains in public squares.

The above is exclusive of the school-houses, engine-houses, police stations, and other city buildings, for which special rates are charged, except where meters are located.

All premises supplied with Fresh Pond water have been visited during the year, and from this inspection, aided by reports from plumbers, a considerable amount of water rates has been added for fractional parts of the year.

Respectfully submitted,

J. WARREN COTTON,
Registrar.

REPORT

OF THE

COMMITTEE ON ACCOUNTS OF THE CAMBRIDGE WATER BOARD.

We have examined the abstract of accounts as presented by the Water Registrar, covering the records of the past year. We have compared these with the statements submitted to us by the City Treasurer and Auditor, and we find them to agree. Annexed, in brief, is the financial statement presented to us by the Water Registrar, and verified by us.

Amount of bills in City Treasurer's hands uncollected Nov. 30, 1881: —			
For water rates		$423 71	
" meter rates		95 64	
" supplies and repairs		580 12	
			$1,098 93
Amount of bills deposited with City Treasurer for collection during the year ending Nov. 30, 1882: —			
For water rates		$146,864 66	
" meter rates		35,013 55	
" supplies and repairs		4,264 07	
" turning off and on, seals and fines,		610 35	
" rent of house at pipe yard . . .		144 00	
			186,896 63
Of these amounts the Treasurer has collected	$183,316 68		
Less refunded	1,299 02		
		$182,017 66	
Refunded as above		1,299 02	
Abated		3,529 29	
Balance uncollected, Nov. 30, 1882		1,149 59	
		$187,995 56	$187,995 56

JAMES M. W. HALL,
JAMES A. FOX,
GEO. H. HOWARD,
Committee on Accounts.

NOVEMBER 30, 1882.

REPORT

OF THE

SUPERINTENDENT OF THE WATER WORKS.

To the President and Members of the Cambridge Water Board:—

GENTLEMEN,—The annual report of your superintendent upon the condition of the works and the operations of the past year is herein presented.

The total amount of water pumped is 903,234,909 gallons.

Coal consumed per million gallons pumped, 1,670.93 pounds.

Water sold by meter, and that used for watering streets, 233,497,905 gallons, leaving as the amount for domestic use 669,737,004 gallons.

Number of gallons daily for each inhabitant on the whole amount pumped, 44⅕ gallons.

Number of gallons daily for each inhabitant on amount for domestic use, 32¾ gallons.

Spy and Little Ponds, Wellington Brook, and Conduit.

From analysis of the water of Spy Pond there does not appear to be any improvement in its condition. No water has been drawn from it during the year. The gate-house and gate are in good condition.

Slight repairs have been made on the foundations of the gate-house at Little Pond where the ice had loosened the stones. The gate was opened, letting water through the conduit to Fresh Pond, Feb. 27th (the Little Pond gauge at 15.25), and kept open until March 1st, when it was again closed.

The filter basin appears to be in good repair.

There is no apparent change in the condition of Wellington Brook and its branches since my last report. The gates were opened Jan. 26th, supplying Fresh Pond from this source until April 5th, when they were again closed. On March 2d the amount of drainage from Niles Brothers' muck heaps was large. From this cause of pollution we are continually threatened, and, doubtless, we shall again have trouble whenever there is a thaw.

Owing to the height of water no interior inspection has been made of the conduit, which appears to be in good condition.

Fresh Pond.

The banks at and around the gate-house and conduit at Black's Nook have settled to such an extent that repairs must be made in the spring.

The engine-house and gate-house on the border of the pond, at the end of the brick conduit, have been painted, and the stone slope of the pump-room has been taken up and relaid in cement, as the stones had become loosened by muskrats and action of the water.

The water of the pond has been of its usual excellent quality during the year.

The pond reached its highest point, 15.87, March 28th, and lowest, 10.69, Nov. 30th.

Engine-House.

Slight repairs have been made on the roof balustrade, and the building has been thoroughly painted. A new 4-inch iron blow-off pipe has been laid from the boilers to the sewer in Fresh Pond drive. The old cement one had become useless and was tumbling to pieces.

A new tell-tale pipe has been laid in the trench dug for the high-service force main, connecting with the larger reservoir, and attached to the mercury gauge. The old one gave trouble from freezing during the winter.

The grounds about the engine-house and of Tudor Park have received the necessary care, and the fences have been repaired. I recommend that a good substantial fence of wood or iron be put around Tudor Park and the engine-house lot, as the one now in place affords little protection to the grounds and trees.

Reservoir.

No repairs have been made during the year. The high retaining wall, near the northwest corner, on Reservoir Street, shows a slight movement since last year, but was deemed safe by your committee until the coming spring. There is no indication of leakage other than has been heretofore reported. The gates are in good condition. The grass has been cut and walks graded from time to time.

The tank for the chronograph float has been reset and the chronograph is in working order, but experience has shown the stand-pipe house to be an unsuitable place for it. The constant dampness of the stand-pipe causes the paper to cockle, at times giving imperfect records, especially in wet weather. There should be a dry and warmer room for this instrument. Its action is of great value, constantly recording the fluctuations of the water level in the reservoir, and of particular importance are the diagrams of night consumption, which are the only true records of the condition of the works in regard to waste and leakage. I recommend a small, neat house to be built, about twelve feet north of the stand-pipe, specially for the chronograph, and then desirable improvements could be made in the tank, whereby more perfect records would be obtained.

High Service.

The high-service system has been completed in accordance with plans adopted by your Honorable Board last year. Contracts were made with the Warren Foundry to furnish pipes and special castings, with H. R. Worthington to furnish engine and pump, and with the Coffin Valve Company to furnish gates and check-valves, all to be delivered on or before April 1st, 1882. A portion of the pipes being on hand, the work was commenced March 13th, and finished June 10th, and at 10.30 of that day the gates were opened and the pump started. Since this time it has run uninterruptedly, accomplishing all the expected results and with a large reserve of capacity for the future growth of the high territory.

There were laid for this service the following lengths of pipe: 2,060 feet of 10-inch and 12-inch (for force main), 24 feet of

4-inch at engine-house (charging pipe), 17 feet of 4-inch at Lake View Avenue (for blow-off), 80 feet of 4-inch in Huron Street, 225 feet of 4-inch in Fayerweather Street, 303 feet of 2-inch and 142 feet of 1½-inch in Reservoir Street, 70 feet of 1¼-inch and 2,060 feet of ¾-inch for tell-tale, 278 feet of 4-inch in Mt. Vernon Street, 352 feet of 6-inch in Lambert Avenue, 976 feet of 6-inch in Linnæan Street, 85 feet of 4-inch in Concord Avenue, north of Sparks Street, and 2,305 feet of 8-inch in Highland Street, Appleton Street, and Vassal Lane to Sparks Street, a total length of pipe of all sizes of 8,977 feet. There were used eleven 6-inch check-valves and one 10-inch, placed at various points on contour line 58 grade, separating the high and low service, and also one 12-inch gate, one 10-inch, two 8-inch, six 6-inch, and four 4-inch, making a total of 12 check-valves and 12 gates.

Main Pipe.

Aside from the high service, main pipe has been laid in the following streets: 108 feet of 4-inch in Elm Street, 241 feet of 4-inch in Henry Street, 160 feet of 6-inch in Prison Point Street, 77 feet of 4-inch in Somerset Street, 134 feet of 2-inch and 43 feet of 1½-inch in Stinson Court, 405 feet of 6-inch in Lancaster Street, 96 feet of 4 inch in Lancaster Court, 94 feet of 4-inch in Summer Street, 112 feet of 4-inch in Dunster Street, 36 feet of 6-inch in Beech Street, 24 feet of 6-inch in Binney Street, 120 feet of 8-inch in New Ninth Street, 134 feet of 1-inch in Lyman Street, 168 feet of 6-inch in Montgomery Street, 253 feet of 4-inch in Blanche Street, 110 feet of 1½-inch and 361 feet of 1¼-inch in Osborn and Albany Streets, 72 feet of 6-inch in Munroe Street, 224 feet of 6-inch in Western Avenue, 114 feet of 4-inch in Sixth Street, 131 feet of 6-inch in First Street, 157 feet of 6-inch in Martin Street, 150 feet of 4-inch in Parker Street.

In the territory known as the Cambridge Street district, including Willow, Harding, Jefferson, Porter, Bedford, and McCabe Streets, the old pipe has been abandoned, except where it was practicable to raise it (it was 337 feet in length), and 2,170 feet of 4-inch new pipe has been laid, with fifty new supplies from the mains, and sidewalk shut-offs put on. This was a much-needed improvement, the mains and supplies being from six to nine feet deep, making it expensive repairing or shutting off.

In consequence of Ninth Street being changed in location between Binney and Potter Streets, the main pipe was taken up and relaid under an agreement made with the City Council by the American Rubber Company.

In Lambert Avenue 310 feet of pipe was lowered on account of a change in the street grade.

On Putnam Avenue about 100 feet of 16-inch pipe has been lowered where it crosses the old mill-pond canal, in consequence of filling at this point by the Street Department. The house and bridge supporting the pipe were removed, and the pipe bedded in gravel.

All the main pipes east of Harvard Square have been tested, by sections, at night, between the hours of twelve and five, during the months of September and October, with very satisfactory results. At the completion of this inspection the chronograph showed the least loss from the reservoir between the hours of 12 and 4 A. M. that we have had for several years, the total fall for the four hours being 3.59 inches, equivalent to 114,673 gallons' discharge, or 28,668 gallons per hour.

All of the gates have been inspected and their locations marked.

New Supplies.

Two hundred and one new supplies have been laid during the year, making the total at this date 7,724. Twenty old supplies have been renewed, besides the renewals in the Cambridge Street district, and fifty-two old supplies have been furnished with sidewalk shut-offs. All the supplies on Cambridge and Bridge Streets should have sidewalk shut-offs, as the amount of shutting off and letting on in this locality causes so much digging up of the streets.

Leakage.

One hundred and fifty-two leaks have been stopped; one on 2-inch main, two on 3-inch iron, twelve on 4-inch iron, two on 4-inch cement, four on 6-inch iron, two on 8-inch iron, four on 10-inch cement, one on 20-inch iron, one on 24-inch, and two on 30-inch pumping mains, thirty-four on supplies in street, twenty-two on supplies within premises, and sixty-five repaired by owner or occupant after notice from the office. All of the fixtures throughout the city have been inspected during the year, and in some localities twice, notice being left on the premises wherever any imperfect fixtures or waste of water had been detected. The work has been quietly done, and the expense has been light.

Thirty-four hydrant and fifty-one gate boxes have been set in place of decayed ones removed.

Brookline Street Pipe Bridge.

Repairs have been made on the house covering the pipe where it was damaged by the ice during the winter.

Hydrants, etc.

Seventeen new post hydrants have been set during the year, all in new locations, and one post hydrant in place of flush hydrant removed, at Tower's factory, on Broadway.

Three flush hydrants have been removed viz.: Main Street at junction of Harvard, Broadway at Third, and Waverly at corner of Talbot.

The present number is 260 post and 336 flush hydrants.

One garden hydrant has been set, making the present number 111.

Thirteen meters have been set and thirteen removed, leaving the present number the same as last year, 157.

The drinking fountain at Fort Washington has been discontinued, and two have been removed,—Main Street at junction of Front; and west side of Third Street, north of Main; one has been added at junction of Main Street with Broadway; making the present number fifteen.

Two stand-pipes have been put in and one discontinued. The present number is 36.

Pipe Yard.

The sheds at the pipe yard have been repaired, and slight repairs made on the dwelling, painting and papering. All of the buildings are now in good repair.

Accompanying this report is that of the engineer at the pumping works, and tables showing the monthly amount and daily average of water pumped, the Fresh Pond record of water heights, the locations of fountains, stand-pipes, and meters, the details of main and supply extensions, and the amount of stock on hand.

Respectfully submitted,

HIRAM NEVONS,

Superintendent.

CAMBRIDGE, Dec. 2, 1882.

List of Meters in Use Nov. 30, 1882.

METERS.	Locality.	Size.	Description.
		Inch.	
Andrews, A. H.	Ninth St.	¾	Désper.
American Rubber Co.	Potter St.	4	Crown.
American Net and Twine Co.	Third St.	1½	Worthington.
American Steam Safe Co.	Main St.	1	"
Badger & Daniels	Thorndike St.	¾	Désper.
Barbour, W. O.	Main St.	¾	Worthington.
Bird, H. M (Iron Foundry)	Broadway	⅝	Union Rotary.
Boston Woven Hose Co.	Broadway	1½	Worthington.
Boston Stamping Co. (Tinware Manufactory)	Third St.	2	"
Boston Chemical Works	Third St.	1	"
Boston & Lowell R. R. (Repair Shop)	Bridge St.	2	"
Boston & Lowell R. R. (Round House)	Prison Point St.	2	"
Boston & Lowell R. R. (New Round House)	Prison Point St.	2	"
Boston & Lowell R. R. (Paint Shop)	Prison Point St.	1	"
Boston & Lowell R. R. (Filling Locomotives)	Prison Point St.	6	Union Rotary.
Boston & Lowell R. R. (Car House)	Prison Point St.	2	Worthington.
Bullock, O. S. (Machine Shop)	Broadway	1	"
Carr Brothers (Soap Factory)	Lopez St.	1	"
Capen, Sprague & Co. (Oil Works)	Sixth St.	¾	"
Cambridgeport Diary Co.	Magazine St.	1	"
Cambridge Gas Light Co.	Third St.	2	"
Campbell Bros. (Boiler Factory)	Osborn St.	⅝	"
City of Cambridge (Shepard School)	North Ave.	2	"
City of Cambridge (Ward 1 Building)	Brattle Sq.	2	"
City of Cambridge (Ward 4 Building)	Central Sq.	1½	"
City of Cambridge (Cemetery)	Coolidge Ave.	4	"
City of Cambridge (Almshouse)	Tannery St.	2	"
Close Geo. (Confectionery)	Broadway	1	"
Clark, B. P. & Co. (Confectionery)	Main St.	1½	"
Cochran, A. & Co. (Ammonia Factory)	Potter St.	¾	"
Coleman, John & Sons (Coal Wharf)	Broadway	1	"
Coopers' Car Wheel Co.	Hampshire St.	⅝	Désper.
Cofran, S. M. (Brick Yard)	Concord Ave.	2	Worthington.
Coolidge, J. G. (Floral Conservatory)	Coolidge Ave.	1	"
Coolidge, J. G.	Coolidge Ave.	2	"
Davis, Curtis, & Co. (Soap Factory)	Broadway	1½	"
Davis, J. C. & Son (Soap Factory)	Broadway	1	"
Davis, Mason (Soap Factory)	Lincoln St.	⅝	"
Dailey, Chas. W. (Livery Stable)	Cambridge St.	1	"
Derby, H. (Vinegar Works)	Main St.	1	Crown.
Downing, Theo. (Tannery)	Eustis Ct.	1	Worthington.
Draper, F. & Co. (Brass Works)	Otis St.	⅝	Union Rotary.
De Rosay & Son (Brick Yard)	Dublin St.	¾	Worthington.
East Cambridge Club Stable	First St.	1	"
Ela Brothers (Ivory Turning)	Broadway	1	"
Episcopal Theological Seminary (Dormitory)	Brattle St.	1½	"
Fenton, H. & Co. (Mattress Factory)	Gore St.	¾	Désper.
French, C. A. (Hotel)	Farwell Pl.	1	Worthington.
Geldowsky, F. (Furniture Manufactory)	Otis St.	1	"
Gilmore & Eustis (Rolling Mill)	Portland St.	2	"
Goepper Bros. (Barrel Factory)	Ninth St.	2	"
Greely, Leander (Planing Mill)	Broadway	1½	"

List of Meters in Use Nov. 30, 1882. — *Continued.*

METERS.	Locality.	Size.	Description.
		Inch.	
Griffin & Dolan (Soap Factory)	Decatur St.	¾	Désper.
Harvard College (Boylston Hall)		2	Crown.
Harvard College (Holworthy Hall)		¾	Worthington.
Harvard College (Stoughton Hall)		⅝	"
Harvard College (Sever Hall)		1	"
Harvard College (Thayer Hall)		1½	"
Harvard College (In Yard)		1½	"
Harvard College (Memorial Hall)	Cambridge St.	2	"
Harvard College (Boat-House)	Flagg St.	¾	Ball & Fitts.
Harvard College (Botanical Garden)	Garden St.	1	Worthington.
Harvard College (Gymnasium)	Cambridge St.	1	"
Harvard College (Holyoke House)	Harvard St.	2	"
Harvard College (Museum Comp. Zoölogy)	Divinity Ave.	1	"
Harvard College (Scientific School)	Kirkland St.	⅝	Désper.
Harvard College (New Law School)	Holmes Pl.	¾	Worthington.
Hazlett, W. H. & Co. (Planing Mill)	Otis St.	1½	"
Hews, A. H. & Co. (Pottery)	Crescent Ave.	1	"
Hixon, Edward, Jr. (Furniture Factory)	Main St.	¾	Ball & Fitts.
Holmes, F. M., Manuf. Co. (Furniture)	Cambridge St.	2	Worthington.
Houghton, H. O. & Co. (Publishers)	Blackstone St.	2	"
Hovey & Co., north side (Floral Conservatory)	Cambridge St.	1	"
Hovey & Co., south side (Floral Conservatory)	Cambridge St.	¾	"
Ivers & Pond (Piano Factory)	Albany St.	1	Union Rotary.
Jaynes & Co (Barrel Factory)	Pacific St.	1	Worthington.
Jones, C. L. & Co. (Soap Factory)	Pearl St.	¾	"
Kemp, L. & Son (Soap Factory)	Davis St.	1	Ball & Fitts.
Kennedy, F. A. (Cracker Factory)	Green St.	1½	Worthington.
Kendall & Roberts (Iron Works)	Main St.	¾	"
Low, J. W. (Tannery)	Reed St.	1½	"
Loan, J. J. (Soap Factory)	Columbia St.	¾	Union Rotary.
Little, Brown & Co. (Book Bindery)	Blackstone St.	¾	Worthington.
Lincoln & Chamberlin (Slaughter House)	Distillhouse St.	¾	"
Mason & Hamlin Organ Co.	Broadway	1	"
Middlesex Bleachery (Dye Works)	Sacramento St.	¾	"
Middlesex County (House of Correction)	Thorndike St.	2	"
Middlesex County (Court House)	Thorndike St.	¾	"
Middlesex County (Court House)	Otis St.	¾	Ball & Fitts.
Middlesex County (Registry of Deeds)	Otis St.	¾	Worthington.
Millan, Alex. (Fish Market)	Brattle St.	½	Désper.
Moering, Mrs. A. L. (Beck Hall)	Main St.	1	Worthington.
Mt. Auburn Corporation (Floral Conservatory)	Brattle St.	1	"
Mt. Auburn Corporation (Cemetery)	Mt. Auburn St.	¾	Désper.
Murdock, W. H. (Floral Conservatory)	Grigg St.	⅝	"
New England Glass Co.	North St.	2	Worthington.
Norton, E. H. (Soap Factory)	Winsor St.	¾	Désper.
Page, Geo. G. & Co. (Box Factory)	Hampshire St.	2	Worthington.
Parry, Bros. & Co. (Brick Yard	Raymond St.	⅝	"
Pike, James & Co. (Livery Stable)	Church St.	1	"
Pike, Joel S. (Livery Stable)	Palmer St.	1	"
Porcellian Club (Harvard Students)	Harvard St.	¾	Union Rotary.
Porter's Hotel (Frank Locke)	North Ave.	¾	Worthington.
Prospect House (Joseph Uhrig)	Main St.	1½	"
Ross House (Mrs. H. P. Ross)	Broadway	⅝	"
Reardon, John & Sons (Oleomargarine Factory)	Talbot St.	4	"
Reardon, William (Soap Factory)	Portland St	⅝	Désper.
Revere Sugar Refinery (south side)	Water St.	3	Worthington.
Revere Sugar Refinery (north side)	Water St.	3	Union Rotary.
Reversible Collar Co.	Mt. Auburn St.	1	Worthington.
Rhoades, Silas, & Son (Planing Mill)	State St.	2	"
Rideout, M. E. & D. T. (Planing Mill)	Banks St.	¾	"
Roberts, O. P.	Brattle St.	1	"
Robinson, J. P. & Co.	Main St.	1	Crown.
Rogers, Geo. M.	Washington St.	3	Worthington.
Russ Moulding Co.	Thorndike St.	¾	Crown.
Sands, John L., Estate (Brick Yard)	Walden St.	¾	Worthington.
Sanborn, G. P. & Son (Pickling Factory)	Gore St.	¾	Désper.
Shorey Geo. L. (Laundry)	Soden St.	1½	Worthington.
Shaw & Applin (Furniture Manufactory)	Bridge St.	1½	"
Smart, D. C. (Wood Turning)	Main St.	⅝	Désper.
Sortwell & Co. (Distillery)	Distillhouse St.	2	Worthington.
Squire, John P. & Co. (Slaughter House)	Gore St.	4	"
Squire, John P. & Co. (Slaughter House)	Gore St.	2	"
Squire, John P. & Co. (Stable)	Gore St.	1	"

List of Meters in Use Nov. 30, 1882.—*Concluded.*

METERS.	Locality.	Size.	Description.
		Inch.	
St. Mary's Church	Norfolk St.	2	Worthington.
Stiles, John C. (Omnibus Stable)	Cambridge St.	2	"
Stiles, John C. (Watering Horses)	Inman Sq.	⅝	Désper.
Tower, Sylvester (Piano Key Factory)	Broadway	1	Worthington.
Tug "Henry Chapel" (Steamboat)	First St.	2	Crown.
Thayer, Henry & Co. (Laboratory)	Broadway	2	Worthington.
Tribune Publishing Co.	Linden St.	⅝	Désper.
Tracey, M. F.	Brighton St.	1	"
Union Railway Co. (Washing Cars)	Dunster St.	¾	Worthington.
Union Railway Co. (Repair Shop)	Dunster St.	¾	"
Union Railway Co. (Car House)	Dunster St.	¾	"
Union Railway Co. (Wooden Stable)	Dunster St.	¾	"
Union Railway Co. (Brick Stable)	Dunster St.	1½	"
Union Railway Co. (North Side)	Cambridge St.	1	"
Union Railway Co. (South Side)	Cambridge St.	1	"
Union Railway Co. (Car House)	Baldwin St.	1	"
Union Railway Co. (Stable)	Mt. Auburn St.	1	"
Union Railway Co. (Stable)	Main St.	1	"
Union Railway Co. (Stable)	North Ave.	2	"
Union Railway Co. (Car House)	Cambridge, cor. Baldwin St.	1	Désper.
Union Railway Co. (Stable)	River St.	1	Worthington.
Union Railway Co. (Stable)	Murray St.	1½	"
Union Railway Co. (Washing Cars)	Murray St.	1½	Crown.
Union Glass Co. (Packing Room)	Webster Ave.	¾	Désper.
Union Glass Co. (Pot Room)	Webster Ave.	1	Worthington.
Warren, J. H. (Felton Hall)	Cambridge St.	1½	"
Wellington, J. A. & Co. (Coal Wharf)	Fifth St.	⅝	"
Wilson, John, & Son (Publishers)	Brattle Sq.	1	"
Woodbridge, S. F. (East Slaughter House)	Frank St.	1	"
Woodbridge, S. F. (West Slaughter House)	Frank St.	⅝	"
Woods, Geo. & Co. (Organ Factory)	Main St.	2	"
Wight & Scorgie (Marble Polishing)	Mt. Auburn	¾	Désper.

List of Drinking Fountains, Nov. 30, 1882.

Bridge Street, junction of Cambridge Street.
Broadway, southwest corner of Norfolk Street.
Brattle Square, east side of Brewer's Block.
Brattle Street, junction of Fresh Pond Lane.
Cambridge Street, south corner of Fifth Street.
Central Square, west side.
Central Square, east side.
Hampshire Street, junction of Broadway.
Harvard Square, at the flag-staff.
Inman Square, east side.
Main Street, junction of Broadway.
Main Street, junction of Mt. Auburn Street.
North Avenue, southwest corner of Walden Street.
North Avenue, north side, west of Cameron Street.
Putnam Avenue, southwest corner of Pearl Street.

List of Stand-Pipes (for Street Watering), Nov. 30, 1882.

Brattle Street, near University Press.
Brattle Street, corner of Sparks Street.
Brattle Street, near Fayerweather Street.
Brattle Street, near Fresh Pond Lane.
Bridge Street, junction of Cambridge Street.
Broadway, near Third Street.
Broadway, corner of Sixth Street.
Broadway, corner of Winsor Street.
Broadway, junction of Hampshire Street.
Brookline Street, corner of Putnam Avenue.
Cambridge Street, near Warren Street.
Cambridge Street, near Winsor Street.
Cambridge Street, at Inman Square.
Columbia Street, near Austin Street.
Concord Avenue, at junction of Garden Street.
Dana Street, at corner of Chatham Street.
Gore Street, west of Third Street.
Green Street, near Western Avenue.
Harvard Street, corner of Prescott Street.
Inman Street, near Broadway.
Kirkland Street, near Quincy Street.
Main Street, near Portland Street.
Main Street, near Hancock Street.
Magazine Street, opposite Warland Street.
Mt. Auburn Street, near Athens Street.
North Avenue, near Common.
North Avenue, corner of Sacramento Street.
North Avenue, near Roseland Street.
North Avenne, near Beech Street.
North Avenue, near Spruce Street.
North Avenue, corner of Norris Street.
North Avenue, opposite Tannery Street.
Prison Point Street, opposite Round House.
River Street, near Putnam Avenue.
Sixth Street, near Thorndike Street.
Third Street, near Rogers Street.
Thorndike Street, near Third Street.
Western Avenue, near Howard Street.

New Main Pipe, laid for Extensions and Renewals, from Dec. 1, 1881, to Nov. 30, 1882, inclusive, with the Number of Gates and Fire Hydrants used.

LOCATION.	Iron Pipe.		Gates.		Fire Hydrants.	
	Size.	Length.	No.	Size.	No.	Size.
	Inch.	Feet.		Inch.		Inch.
At Engine House	4	24				
High-Service Pumping Main	12	......	1	12		
	10	2,060	1	10		
Lake View Avenue	4	17	1	4		
Huron Street	4	80	1	4		
Fayerweather Street	4	225				
Reservoir Street	2	303	1	8		
	1¼	142	1	6		
Tell-tale	1¼	70				
	¾	2,060				
Mt. Vernon Street	4	278	1	4		
Lambert Avenue	6	352	1	6		
Linnæan Street	6	976	3	6		
Concord Avenue	4	85	1	4		
Vassal Lane, Appleton and Highland	8	2,305	1	8		
Elm Street	4	108				
Henry Street	4	241				
Prison Point Street	6	160				
Somerset Street	4	77				
Stinson Court	2	134				
	1¼	43				
Lancaster Street	6	405	1	6	1	6
Lancaster Court	4	96				
Summer Street	4	94				
Dunster Street	4	112	1	4		
Beech Street	6	36				
Binney Street	6	24	1	6	1	6
New Ninth Street	8	120	....	....	1	6
Lyman Street	1	134				
Montgomery Street	6	168	1	6		
Blanche Street	4	253				
Osborn and Albany Streets	1¼	110				
	1¼	361				
Munroe Street	6	72				
Western Avenue	6	224	1	4		
Sixth Street	4	114	1	4		
First Street	6	131				
Martin Street	6	157	1	6		
Parker Street	4	150	1	4		
Cambridge Street District	4	2,170	....	....	3	6
North Avenue	....	......	....	....	2	6
Wendell Street	....	......	....	....	1	6
Third Street	....	......	....	....	3	6
Dana Street	....	......	....	....	1	6
Main Street	....	......	....	....	1	6
Waverly Street	....	......	....	....	2	6
Murray Street	....	......	....	....	1	6
Broadway	....	......	....	....	1	6
Auburn and Pearl Streets	....	......	1	4		

List of Check-Valves.

LOCATION.	SIZE.
	Inch.
Lake View Avenue, 150 feet north from Huron Street	10
Lake View Avenue, 150 feet north from Brattle Street	6
Fayerweather and Reservoir Streets	6
Sparks Street, opposite Dr. Wyman's stable	6
Concord Avenue, 135 feet south from Buckingham	6
Buckingham Street, 220 feet west from Concord Avenue	6
Garden and Linnæan Streets	6
Raymond and Linnæan Streets	6
Avon Hill and Linnæan Streets	6
Arlington Street, 230 feet west from North Avenue	6
Mt. Vernon Street, 100 feet west from North Avenue	6
Mt. Pleasant Street, 150 feet south from Walden Street	6

Recapitulation.

	12 in.	10 in.	8 in.	6 in.	4 in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	Totals.
Length of iron pipe	276	1,784	2,425	2,705	4,124	437	295	431	134	2,060	14,671
Number of gates	1	1	2	9	9						22
Number of hydrants	...	....	....	18							18
Number of check-valves,	...	1	....	11							12

New Supplies.

GALVANIZED PIPE AND BRASS FITTINGS, USED FROM DEC. 1, 1881, TO NOV. 30, 1882, INCLUSIVE.

		6 in.	4 in.	2 in.	1½ in.	1¼ in	1 in.	¾ in.	Totals.
Length galvanized pipe	....	44	594	438	....	126	528	6,711	8,441
Number of supplies	....	1	2	7	....	1	8	182	201
Number of stop and wastes	....	....	....	6	....	2	7	187	202
Number of screw cocks	....	....	....	4	....	2	7	158	171
Number of sidewalk cocks	....	....	....	....	....	....	6	181	187
Number of sidewalk standpipes	187	....	....	....	....	....	....	.....	187
Number of boxes, frames and covers	12	....	....	....	....	....	....	.....	12
Number of gates	....	1	2	....	....	....	....	.....	3

Statement of Stock on Hand, Dec. 1, 1882.

FOR STREET MAINS (IRON PIPE AND FITTINGS).

NUMBER OF	48 in.	30 in.	24 in.	20 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Straight pipes (12 ft. ea.)	2	25	....	17	16	11	16	14	85	111	...
Elbows	...	...	....	....	2	....	.....	....	....	....	...
Bends (1-36″)	...	...	2	2	....	2	9	1	7	2	...
Y branches	...	...	1	....	....	1	.....	....	....	....	...
Sleeves	...	2	8	8	4	8	8	2	11	4	7
Clamp sleeves	...	...	4	5	1	4	7	8	5	4	9
Drain offsets	...	...	....	....	....	....	.....	....	17	....	...
Offsets	...	...	....	....	....	....	6	....	6	4	...
Gates	...	...	....	....	....	2	2	....	1	....	1
Check-valves	...	...	2	....	....	....	.....	....	1	....	...
Blow-off branches	...	...	....	2-6″	....	....	.....	....	....	....	...
Caps	...	...	2	....	2	7	6	8	5	5	1
Crosses	...	...	....	1-20″	1-12″	5-10″	2-10″	1-8″	5-6″	13-4″	1-3″
	...	...	....	2-10″	3-6″	6-6″	2-8″	....	10-4″	....	...
	...	...	....	....	....	1-4″	7-6″	....	....	....	...
	...	...	....	....	....	4-3″	.....	....	....	....	...
Reducers	...	...	1-10″	2-12″	1-6″	2-10″	8-8″	6-6″	11-4″	1-3″	...
	...	...	1-8″	1-8″	....	1-6″	3-6″	....	....	....	...
T's	...	...	1-24″	3-20″	1-6″	8-10″	10-10″	2-8″	11-6″	9-4″	...
	...	...	1-8″	2-12″	....	6-6″	4-8″	13-6″	11-4″	....	...
	...	...	3-6″	2-6″	....	5-4	19-6″	2-4″	....	....	...

FOR SUPPLIES (GALVANIZED PIPE AND BRASS FITTINGS).

	2½ in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
Feet in length of galvanized pipe,	....	130	10	75	450	450	
Elbows	....	16	26	18	41	43	
Street elbows	....	......	.....	......	16	95	
Couplings	2	73	29	23	148	95	44
Unions for lead pipe	....	......	......	......	......	14	
Unions	....	20	28	20	33	65	7
Stop and wastes	....	2	1	1	14	56	
Screw cocks	....	4	1	1	30	79	
Side walk cocks	....	......	......	......	......	110	
Screw cocks for cement pipes	....	......	......	......	14	12	
Blow-off cocks	....	......	8	......	......	......	
Hose bibbs	....	......	......	......	12	4	9
Air chambers	....	......	......	......	48	18	43
Socket ends of rods	....	......	......	......	......	94	
Nipples	2	22	40	75	......	50	
Plugs	....	......	23	22	34	121	
Bushings, 166 2-in. to ½ in.	....	......	......	......	......	......	
Fountain cocks	....	......	......	......	......	2	
Hydrant cocks	....	......	......	......	......	7	
Sill cocks	....	......	......	......	......	9	
Hose nipples	....	......	......	......	......	29	
Corp cocks	....	......	......	3	36	......	
Soldering nipples	....	......	......	......	......	15	
T's, malleable iron	....	......	......	23	43	203	41
T's, cast iron	....	280	120	100	100	400	
Crosses	....	70	110	90	80	30	
Reducing couplings	....	......	......	......	......	20	
Caps	....	......	......	......	21	......	
Stand-pipes, 38.							

Stock in Shop and at Yard.

1 lathe, with the usual chucks and tools.
1 water meter.
1 threading machine, with dies complete.
1 drilling machine.
2 tapping machines for supplies.
2 two-inch taps and drill.
1 breast drill.
2 hooks.
1 ratchet for tapping pipe.
1 machine, complete, for tapping cement pipe.
1 gig saw.
1 washer cutter.
1 platform scale.
2 grindstones.
1 large hand pump.
8 thawing pumps.
150 feet of thawing-out pipe.
1 hay cutter.
1 large boom derrick.
3 small derricks.
1 breast derrick.
9 pipe wrenches.
3 monkey wrenches.
7 pipe cutters.
7 pairs tongs.
2 sets main pipe tools.
3 blow-off wrenches.
3 two-inch cock wrenches.
2 one-inch cock wrenches.
3 hydrant wrenches.
14 gate wrenches.
7 oil cans.
8 die plates, with dies complete, from ½ inch to 2 inch.
8 keys to garden hydrants.
4 tool chests.
2 hand carts.
4 chains.
43 shovels.
24 picks.
9 trench rammers.
2 paving rammers, with paving tools.
8 pails.
4 bars.
3 wheelbarrows.
4 tamping bars.
22 lanterns.
400 pounds lead.
90 pounds packing.
4 hydrant bodies.
26 flush hydrants.
7 three-inch nozzles.
19 two-inch nozzles.
6 flush hydrant frames.
40 flush hydrant covers.
2 garden hydrants.
2 post hydrants.
12 post hydrant rods.
5 hydrant valves.
9 bolts for flush hydrants.
3 stop and wastes for flush hydrants.
3 lead kettles and furnaces.
2 screws for raising main pipe.
3 bench vises.
3 drinking fountains.

8 different sizes bends for capping main pipe.
3 hydrant boxes.
6 small gate boxes.
13 large gate boxes.
3 two-inch cock boxes.
2 large frames and covers.
70 risers for gate and hydrant boxes.
180 seals.
4 gross nuts.
1 axe.
2 sledge hammers.
16 gallons oil.
1 pair rubber boots.
½ cord wood.
50 feet three-fourths inch hose.
2 casks cement.
5 screw drivers.
5 files.
1 square.
2 saws.
1 plane, compasses, etc., for carpentering.
5 three-fourths inch Worthington meters.
1 one and one-half inch Worthington meter.
1 two-inch Worthington meter.
1 three-fourths inch Crown meter.
1 five-eighths inch Désper meter.
2 three-fourths inch Désper meter.
1 three-fourths inch Ball & Fitts meter.
1 one and one-half inch Boston meter.
A lot of counters and ratchet movements for meters.
5 six-inch spindles for gates.
2 four-inch spindles for gates.
2 three-inch spindles for gates.
3 horses.
6 wagons.
5 harnesses.
1 sleigh.
1 pung.
1 double-runner sled.
6 blankets.
1 buffalo robe.
2 oil covers for horses.

REPORT

OF THE

ENGINEER OF THE PUMPING STATION.

PUMPING STATION, CAMBRIDGE WATER WORKS,
CAMBRIDGE, Dec. 1, 1882.

Hiram Nevons, Esq., Supt. Cambridge Water Works: —

SIR, — I would report the engines and boilers in good condition, no extensive repairs having been required during the past year. The high-service engine, which was started on the 10th of June last, has run daily since that time, doing the work easily and satisfactorily. The metallic packing, fitted to piston rods and valve stems of engine No. 3 and to piston rods of engine No. 2, has worked perfectly, and I would recommend that it be fitted to engine No. 1. The auxiliary engine and pump are in perfect condition, and ready to be started when wanted.

Following will be found a statement of the expenses at the pumping station, together with the engine record, pond levels, and rainfall for the past year, also a list of stock and tools on hand.

E. C. BROOKS, *Engineer.*

Statement.

413 tons Cumberland coal @ $5.74	$2,370 62
$31\frac{1370}{2240}$ tons Cumberiand coal @ $7 a ton	221 28
$229\frac{350}{2240}$ tons Cumberland coal @ $6.30	1,443 68
Oil, waste, packing, etc.	242 10
Repairs on engines and boilers	154 28
Repairs on buildings, and care of grounds	231 80
Tools	70 23
Salaries	3,360 00
Total	$8,093 99

Engine Record, Pond Levels, and Rainfall.

DATE.	LOW-SERVICE ENGINES.						HIGH-SERVICE ENGINE,						Total Water pumped.	Daily Average Water pumped.	Total Coal consumed.	Daily Ave'ge Coal consumed.	Ave'ge Height of Pond.	Rain-fall.
	Total Pumping Time.		Daily Average Pump'g Time.		Total Water pumped.	Daily Average Water pumped.	Total Pumping Time.		Daily Average Pump'g Time.		Total Water pumped.	Daily Av'age Water pum'd.						
	Hrs.	Min.	Hrs.	Min	Gallons.	Gallons.	Hrs	Min.	Hrs.	Min.	Gallons.	Gallons.	Gallons.	Gallons.	Pounds.	Pounds.	Feet.	Inches.
December, 1881......	312	30	10	5	65,355,900	2,108,255	.....	....	....	....	....	....	65,355,900	2,108,255	112,900	3,642	11.37	3.30
January, 1882......	360	5	11	37	76,165,800	2,456,961	....	....	....	....	....	....	76,165,800	2,456,961	127,100	4,100	11.37	4.73
February, "	315	15	11	16	65,514,600	2,339,807	.....	....	....	....	....	....	65,514,600	2,339,807	114,100	4,075	12.58	4.48
March, "	322	25	10	24	66,408,000	2,142,190	.....	....	....	...	....	....	66,408,000	2,142,190	116,200	3,749	15.53	2.49
April, "	304	40	10	9	64,110,600	2,137,020	.....	....	....	....	....	....	64,110,600	2,137,020	111,000	3,700	15.61	2.27
May, "	344	55	11	8	74,975,700	2,418,571	.....	....	....	....	....	....	74,975,700	2,418,571	121,000	3,903	15.21	4.93
June, "	373	55	12	28	84,021,000	2,800,700	260	30	12	24	1,878,603	89,457	85,899,608	2,863.320	131,500	4,382	14.77	2.73
July, "	385	10	12	25	86,762,100	2,798,778	385	10	12	25	2,517,984	81,225	89,280,084	2,880,003	141,600	4,568	13.81	2.08
August, "	395	20	12	45	89,715,000	2,894,032	395	20	12	45	2,976,442	96,014	92,691,442	2,990,047	155.400	5,013	12.53	1.41
September, "	346	40	11	33	74,769,900	2,492,330	346	40	11	33	2,029,613	67,654	76,799,513	2,559,983	129,600	4,320	11.76	7.80
October, "	330	55	10	40	73,183,200	2,360,748	330	55	10	40	1,787,578	57,664	74,970.778	2,418,412	125,100	4,035	11.53	2.19
November, "	320	20	10	41	69,409,500	2,313,650	320	20	10	41	1,653,389	55,113	71,062,889	2,368,763	123,700	4,123	10.95	1.21
Total............	4112	10	....	....	890,391,300	....	2,038	55	....	....	12,843,609	....	903,234,909	....	1,509,200	....	....	39.62
Daily Average....	11	16	....	....	2,430,428	....	11	43	....	....	78,814	....	2,474,616	....	4,135	....	13.08	

Stock on Hand Dec. 1, 1882.

$426\frac{1}{2}\frac{89}{2240}$ tons Cumberland coal; 3 gallons cylinder oil; 10 gallons machine oil; 35 gallons kerosene; 85 pounds cotton waste; 65 pounds rubber packing; 5 pounds asbestos packing; 20 pounds American packing; 2 cylinder-head gaskets; 24 9-inch rubber valves; 2 valve seats; 2 steam gauges; 10 pounds Babbitt metal; 1 pound solder; 2 pounds red lead; 10 pounds steel; 5 pounds sheet brass; ½ bale hair felt; 70 pounds soap; 1½ barrels fire clay; 200 common brick; 15 feet 5-inch belting; 5 files; 1½ pounds emery; ¼ quire emery cloth; 10 gauge glasses; 8 lamp chimneys; 3 dozen lamp-wicks; 2 lantern globes; ¼ barrel brimstone; 300 pounds bolts and nuts; 25 pounds nails; 1 pair plungers and rings for No. 2 engine; 20 feet 2-inch brass pipe; 10 feet 1¼-inch brass pipe; 7 feet ½-inch brass pipe; 26 feet 3-inch iron pipe; 10 feet 1¼-inch iron pipe; 30 feet ¾-inch iron pipe; 40 feet ¼-inch iron pipe; 2 1½-inch globe valves; 1 lot pipe fittings assorted sizes; 10 feet 24-inch flange pipe; 8 feet 6-inch flange pipe.

Tools, Furniture, and Instruments.

1 18-inch × 10-foot engine lathe; 2 lathe chucks; 6 lathe dogs; 18 lathe tools; 1 grindstone; 1 3 × 9 engine, with shafting, belting, etc.; 2 vises; 1 vise bench; 1 set pipe dies; 1 set pipe taps; 1 set hand taps; 2 pipe cutters; 14 pairs pipe tongs; 2 hand hammers; 1 copper hammer; 18 cold chisels; 10 files; 6 screw wrenches; 2 Stillson wrenches; 22 fork wrenches; 27 socket wrenches; 1 hydrant wrench; 6 gate wrenches; 2 clamp screws; 1 sledge; 2 ratchets; 24 drills; 1 breast drill; 2 jackscrews; 6 steel bars; 2 soldering irons; 4 cylinder-head cranes; 12 eyebolts; 75 starting bolts; 2 starting keys; 1 chain fall; 1 level; 1 gasket cutter; 2 ladles; 4 wooden horses; 1 oil cabinet; 1 set measures; 1 10-gallon can; 1 6-gallon can; 3 3-gallon cans; 3 1-gallon cans; 2 lamp fillers; 2 funnels; 4 squirt cans; 1 oil pump; 1 carpenter's bench; 4 planes; 3 hand saws; 10 chisels; 7 gouges; 2 screw-drivers; 2 bit stocks; 13 bits; 4 augurs; 1 draw knife; 1 spoke shave; 2 axes; 2 mallets; 1 steel square; 1 set fire tools; 1 coal car; 1 pair platform scales; 2 wheelbarrows;

11 scoop shovels; 4 long-handled shovels; 2 picks; 1 tube brush; 1 forge; 1 anvil; 5 pairs tongs; 2 hand chisels; 1 lawn mower; 1 steel rake; 2 wooden rakes; 2 scythes; 3 forks; 1 weeder; 1 spade; 6 ladders; 3 step ladders; 1 cast-iron roller; 200 feet 2-inch hose and pipe; 100 feet ¾-inch hose and pipe; 1 desk; 2 tables; 2 clocks; 18 chairs; 9 mats; 6 spittoons; 1 water cooler; 6 fire pails; 6 water pails; 4 bracket lamps; 4 lanterns; 6 hand lamps; 1 lot cocoa matting; 1 watering pot; 1 feather duster; 1 dust pan; 2 dust brushes; 1 window brush; 1 floor brush; 1 scrubbing brush; 2 mops; 3 brooms.

Tools, Furniture, etc., at Engine House at Pond.

1 12-inch × 20-inch portable engine and boiler; 1 12-inch centrifugal pump and belt; 1 hand force pump; 30 feet 1-inch hose; 10 feet ¾-inch steam hose; 1 set fire tools; 2 oil cans; 2 bracket lamps; 2 chairs; 1 cot bed and bedding.

EXPENDITURES OF WATER WORKS.

From the Auditor's Report.

Water Works (Construction).

Amount appropriated from revenue of Water Works (Rates, Fines, etc.)		$16,584 06
Amount appropriated for November bills		375 06
		$16,959 12
EXPENDED.		
For Boxes, kyanized	$106 56	
Bricks	61 82	
Bolts	8 76	
Castings	121 30	
Cement	3 30	
Flanges	259 45	
Hose	8 55	
Hydrants	784 95	
Iron	12 80	
Lead, pig	625 70	
Lime	12 00	
Labor, as per pay-roll	3,684 61	
Lumber	12 43	
Mason	53 88	
Meters	847 06	
Nozzles	41 40	
Oil cups	38 00	
Plate iron and labor	13 95	
Pipe, galvanized	809 21	
Piping	6,152 91	
Packing	192 90	
Pans	10 00	
Paints	35 02	
Pump	1,678 00	
Stone cutter	28 00	
Teaming	293 31	
Valves, swing	310 25	
Valves, check	753 00	
Total, as per item No. 42 of expenses		$16,959 12

Water Works (Maintenance).

Revenue from Water Works (Rates, Fines, etc.) .	$27,056 85
Additional appropriation for November bills . .	1,813 21
	$28,870 06

RECEIVED.

For Duplicate bills, as per item No. 37 of receipts	$5 92

EXPENDED.

For Air-chambers	$16 01
Badge	50
Blacksmith work	4 00
Boots, rubber	7 90
Blankets, horse	11 00
Boxes, gate	186 71
Boxes, hydrant	463 71
Bricks	26 10
Car tickets and fares	180 04
Castings	356 61
Clerical aid	1,083 33
Clerk of board	216 66
Directories	7 50
Desk, repairs	75
Expressage	58 46
One half expense of extra train on Fitchburg Railroad on account of bridge repairs	3 75
Examination of stand-pipe . . .	39 00
Food for men repairing break . .	3 27
Frames	4 00
Fuel	4,417 00
Grease	3 00
Handles, hydrant	1 50
Hay and grain	375 31
Amount carried forward . . .	$7,466 11

	Amount brought forward . . .	$7,466	11
For	Harness and repairs	45	00
	Hardware, tools, and repairs . .	401	47
	Hose	53	58
	Horse	125	00
	Horse and wagon, use of . . .	8	75
	Horse-shoeing	82	01
	Horse, clipping	3	00
	Horse, food	3	25
	Insurance	17	50
	Inspector	1,113	76
	Lumber	11	88
	Lime and cement	3	95
	Labor, as per pay-roll	10,104	16
	Labor on hydrants	45	87
	Lead	118	60
	Manure	13	50
	Meters, repairs of	91	74
	Mowing Tudor Park	10	00
	Newspaper	8	50
	Oil	107	52
	Pipe, drain	576	53
	Paper hangings	19	57
	Painting	240	35
	Paving	4	96
	Printing	55	03
	Plumbing	18	25
	Packing	142	62
	Pipes and fittings	670	80
	Registrar, J. Warren Cotton, salary	2,166	67
	Rings, etc.	19	44
	Repairs at Porter's Bridge . . .	12	93
	Rent of wharf	50	00
	Rent of office for one year, eleven months, to Dec. 1, 1882 . . .	1,150	00
	Repairs of boilers	682	47
	Repairs, mason work	148	00
	Amount carried forward . . .	$25,892	77

Amount brought forward . . .	$25,892 77	
For Repairs, piping	100 72	
Repairs, carpenter's work . . .	480 61	
Stencil plate	20	
Springs, rubber	5 00	
Superintendent, H. Nevons, salary,	1,966 67	
Supplies	20 63	
Stationery	94 07	
Stone	2 00	
Stone cutting	1 00	
Telephone, rent	120 00	
Telegram	76	
Teaming	174 80	
Waste	23 21	
Wagon, repairs	87 62	
Total, as per item No. 43 of expenses		$28,870 06

Water Works (Rates, Fines, etc.).

RECEIVED.

For amount of rates, fines, etc., as per item No. 38 of receipts		$179,484 17
Deduct amount transferred to Interest on water loan	$87,457 00	
Deduct amount transferred to Sinking Fund of Water Works . .	44,355 00	
Deduct amount transferred to Water Works (Construction) . . .	16,959 12	
Deduct amount transferred to Water Works (Maintenance) . . .	28,870 06	
		177,641 18
		$1,842 99

EXPENDED.

For Water Rates refunded, as per item No. 44 of expenses	1,299 02
Balance unexpended	$543 97

Water Works (Supplies).

RECEIVED.

For Supply pipes and fittings, as per item No. 39 of receipts		$3,832 51

EXPENDED.

For Labor, as per pay-roll	$1,301 63	
Hydrants	99 90	
Supplies, pipes and fittings	2,283 10	
Total, as per item No. 45 of expenses		3,684 63
Balance unexpended		$147 88

REPORT

OF THE.

TRUSTEES OF THE SINKING FUND OF THE CAMBRIDGE WATER WORKS.

To the Honorable the City Council:—

THE undersigned, Trustees of the Sinking Fund of the Cambridge Water Works, herewith submit the annual report of the fund committed by ordinance to their charge.

The amount of the fund Dec. 1, 1881, was	$427,630 31	
There has been received during the year, interest on investments amounting to	22,899 00	
There has been received from the city of Cambridge three per cent on the amount of outstanding water bonds, viz.	44,355 00	
		$494,884 31
Amount paid for accrued interest on securities purchased for investment . . .	$769 00	
Amount paid as premium on securities purchased for investment	10,977 50	
		11,746 50
Leaving the amount of the fund, Nov. 30, 1882, all securities at par		$483,137 81

The following is a list of the securities belonging to the fund:—

Cambridge Low-land Loan, six per cent coupon bonds, maturing July 1, 1883,	$1,000 00
Cambridge Water Loan, six per cent coupon bonds, maturing Aug. 1, 1883,	1,400 00
Cambridge Low-land Loan, six per cent coupon bonds, maturing April 1, 1884	3.000 00
Amount carried forward	$5,400 00

Amount brought forward	$5,400 00	
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1887,	6,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1888,	25,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing May 1, 1889,	8,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1890,	31,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing May 1, 1891,	26,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1892,	1,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1895	37,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1896 .	46,000 00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1897,	16,000 00	
Cambridge Water Loan, five per cent registered bonds, maturing July 1, 1898	12,500 00	
		$213,900 00
State of Connecticut six per cent coupon bond, maturing Jan. 1, 1883 . . .	$1,000 00	
City of Providence five per cent registered bonds, maturing Sept. 1, 1883 . . .	5,000 00	
City of Charlestown five per cent coupon bonds, maturing Oct. 1, 1883 . . .	1,000 00	
City of Boston five per cent coupon bonds, maturing April 1, 1885 . . .	8,000 00	
City of Boston five per cent coupon bonds, maturing Jan. 1, 1886	1,000 00	
City of Burlington, Vt., six per cent coupon bonds, maturing July 1, 1886 .	500 00	
City of New Bedford four per cent coupon bonds, maturing Oct. 1, 1889. .	8,000 00	
City of Gloucester four and one half per cent coupon bond, maturing July 1, 1890	5,000 00	
Town of Norwalk, Conn., four per cent coupon bond, maturing at pleasure of town after Jan 1, 1891	20,000 00	
Town of Hyde Park four per cent bond maturing July 1, 1891.	5,000 00	
Amounts carried forward	$54,500 00	$213,900 00

Amounts brought forward	$54,500 00	$213,900 00
City of Salem four per cent coupon bonds, maturing July 1, 1892	17,000 00	
Town of Stoughton four per cent coupon bond, maturing Aug. 10, 1893	2,000 00	
Town of Hopkinton four per cent coupon bonds, maturing Oct. 1, 1894	5,000 00	
City of Fall River four per cent coupon bonds, maturing May 11, 1895	9,000 00	
Town of Stoughton four per cent coupon bond, maturing Aug. 10, 1895	2,000 00	
City of Fall River five per cent coupon bonds, maturing May 1, 1898	2,000 00	
Town of Arlington five per cent coupon bonds, maturing July 1, 1898	30,000 00	
Town of Pawtucket, R. I., five per cent coupon bonds, maturing April 1, 1899,	25,000 00	
City of Providence four and one half per cent coupon bonds, maturing June 1, 1899	3,000 00	
City of Boston four per cent registered bond, maturing April 1, 1900	4,000 00	
City of Fall River four per cent coupon bonds, maturing Aug. 1, 1900	13,000 00	
City of Providence five per cent registered bonds, maturing July 1, 1906	50,000 00	
United States four per cent coupon bonds, maturing after July 1, 1907	37,500 00	
Town of Winchester four per cent coupon bonds, maturing May 1, 1908	10,000 00	
Town of Beverly four per cent coupon bonds, maturing July 1, 1911	5,000 00	
		269,000 00
Cash balance in First National Bank, Cambridge		237 81
		$483,137 81

RECAPITULATION.

Town, State, and Government bonds bearing six per cent interest	$202,900 00
Town, State, and Government bonds bearing five per cent interest	134,500 00
Town, State, and Government bonds bearing four and one half per cent interest	8,000 00
Amount carried forward	$345,400 00

Amount brought forward	$345,400 00	
Town, State, and Government bonds bearing four per cent interest	137,500 00	
Cash balance in First National Bank, Cambridge	237 81	
		$483,137 81

No portion of our funded water debt has matured during the year, consequently the fund shows a material increase, viz., $55,507.50. During the coming year $55,000 of our bonds will mature and be paid from our income, without reducing the principal of the fund. The fund as at present constituted is earning an average rate of 5.12 per cent; this average will however be reduced from year to year, unless the market rate now to be obtained on prime investments should advance. The Trustees of this fund have recently made a communication to the City Council with reference to various sums of money which for a series of years have been paid into the City Treasury instead of being paid, as the statute directs, into this fund. These sums referred to represent the excess of receipts over expenditures in the management of the Water Works. It is expected that when the City Auditor shall have verified the amount now due this fund, some definite action will be taken by the City Council in acknowledgment of the debt.

JAMES A. FOX,
GEO. H. HOWARD,
WM. W. DALLINGER,
Trustees of the Sinking Fund of the Cambridge Water Works.

CAMBRIDGE WATER BOARD, 1882.

GEORGE P. CARTER . . . . *President.*

Members of Board.

THE MAYOR,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

CHESTER W. KINGSLEY,	*term expires*	1887.
JAMES M. W. HALL,	" "	1886.
KNOWLTON S. CHAFFEE,	" "	1885.
GEORGE P. CARTER,	" "	1884.
HENRY L. EUSTIS,	" "	1883.

JUSTIN A. JACOBS, *Clerk.*

HIRAM NEVONS, *Superintendent of Works.*
J. WARREN COTTON, *Water Registrar.*

Trustees of Sinking Fund of Water Loan.

THE MAYOR,
CITY TREASURER,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

City of Cambridge.

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THE

NINETEENTH ANNUAL REPORT

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL,

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS,

FOR THE YEAR 1883.

BOSTON:
PRESS OF ROCKWELL AND CHURCHILL,
No. 39 ARCH STREET.
1884.

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No. 39 Arch Street.
1884.

REPORT

OF THE

CAMBRIDGE WATER BOARD FOR 1883.

To the Honorable City Council of the City of Cambridge: —

In compliance with the city ordinance, the Cambridge Water Board herewith submits to you its nineteenth annual report, being for the year ending Nov. 30, 1883: —

Total Cost of the Works.

Cost of the Water Works, Nov. 30, 1882, as per last year's report	$1,745,614 47
Expended on construction account during the year ending Nov. 30, 1883	5,730 50
Making the total expenditure to be	$1,751,344 97

Water Bond Account.

Whole amount of bonds issued	$1,714,900 00
Amount paid from the Water Loan Sinking-Fund	291,400 00
Leaving unpaid water loan	$1,423,500 00
Deduct from this the value of the Water Loan Sinking-Fund, per Trustees' account	496,896 95
Leaving balance of water loan yet to be provided for by the Sinking-Fund	$926,603 05

Statement showing in brief the transactions on account of the Water Works for the year ending Nov. 30, 1883: —

Received.

From water rates	$180,485 23	
Less water rates refunded	1,123 34	
		$179,361 89
Amount carried forward		$179,361 89

Amount brought forward	$179,361 89
Shutting off and letting on water, and fines	529 50
Rent of house	144 00
From supply account	6,053 86
Balance, showing deficiency	2,373 28
	$188,462 53

Expended.

For Construction account	$5,730 50
Maintenance account	45,763 29
Supply account	4,028 74
Interest on water loan	88,585 00
Paid into Sinking-Fund	44,355 00
	$188,462 53

Comparative Receipts.

Water rates for the year ending Nov. 30, 1883	$179,361 89
Water rates for the year ending Nov. 30, 1882	177,430 80
Showing gain during 1883	$1,931 09

The large increase in maintenance account of this year over last year is explained by the amount expended in building dams, and cleaning out of Fresh Pond; riprapping the banks, etc., etc., having been charged to this account, in addition to the ordinary current expenses.

Water Supplied.

The total amount of water pumped during the year was 980,670,464 gallons; the amount pumped in 1882, 903,234,909 gallons,— showing increase during the year, 77,435,555 gallons.

This statement is significant in showing us the rapid increase of the consumption of water in our city, and for which we must provide.

If we now take the total amount of water pumped as above, 980,670,464 gallons, on an estimated population of 60,000, we shall have a daily average for each inhabitant of 44.77 gallons, including all the water used for mechanical purposes, watering streets, and fires. This showing continues us in the list among the most economical in the use of water, as can be seen by comparison with other cities in the list published last year in our report to you.

The analyses made from time to time during the year have not proved quite as good as in some former years, the most noticeable difference being in the increased hardness of the water in the pond as it is drawn down. While this quality does not in any way seem to injure the taste of the water, it is a serious matter when the water is used for washing and other domestic, as well as mechanical, purposes.

Sources of Water Supply.

The water in the pond Dec. 1, 1882, was one foot eight and one-half inches above the conduit. On Dec. 1, 1883, it stood three feet one inch *below* the top of the conduit, showing a loss during the year of 4.91 feet.

On the 27th of August the water had gone so low that our pumps in the engine-house could not safely work any longer, so that at that time we began to pump from the pond into the conduit, which we have continued till now, thus pumping all our supply twice over.

Table showing the rainfall and height of water in the pond: —

MONTHS.	RAINFALL.			BELOW HIGH-WATER MARK.		
	1881.	1882.	1883.	1881.	1882.	1883.
	Inches.	Inches.	Inches.	Feet.	Feet.	Feet.
December, 1882	1.98	3.30	1.87	8.52	5.48	6.45
January, 1883	5.03	4.73	2.94	8.55	5.48	7.10
February, "	4.14	4.48	2.85	8.20	4.27	6.73
March, "	6.07	2.49	1.76	2.65	1.32	5.52
April, "	1.83	2.27	2.48	.98	1.24	5.09
May, "	3.62	4.93	4.10	1.26	1.64	5.63
June, "	6.27	2.73	2.28	1.72	2.08	6.32
July, "	3.41	2.08	2.38	2.36	3.04	7.47
August, "	1.13	1.41	.34	3.24	4.32	8.74
September, "	2.74	7.80	1.18	4.07	5.09	9.87
October, "	2.85	2.19	5.61	4.87	5.32	10.36
November, "	4.68	1.21	1.96	5.23	5.90	10.75
Total for 12 months	42.85	39.62	29.75	av. 4.30	av. 3.77	av. 7.50

A careful examination of this table in connection with our experience of former years shows most conclusively that, so far as we have gone, or have any facts to guide us, our present water supply is slowly, but surely, being exhausted. We have never before had such an opportunity to demonstrate the capacity of Fresh Pond for furnishing a supply of water from unseen sources, which, of course, means the ground flow of water that is tributary to the pond.

We invite your attention to the following calculations, drawn from our experience the past three years; and for this purpose we have taken the month of November in 1881, 1882, and 1883, this being a month when our consumption reaches its lowest point.

DATE.	Average height of water in the pond.	Amount of rainfall during the month.	Fall of the pond during the month.	Total fall of the pond, plus rainfall during the month.	Amount of water received from visible sources.	Amount of water received from unseen sources.	Total water supplied for thirty days.
NOVEMBER.	Feet.	Inches.	Inches.	Inches.	Gallons.	Gallons.	Gallons.
1881..........	11.62	4.08	3.0	7.08	30,440,000	35,974,200	66,418,200
1882..........	10.95	1.26	6.88	8.14	35,002,000	36,060,890	71,062,890
1883..........	6.10	1.96	5.5	7.46	25,110,000	39,897,870	65,007,870

If we now further analyze this statement we shall find this result: —

DATE.	Daily average of water from visible sources during month.	Daily average of water from unseen sources during month.	Daily average of water pumped from all sources during month.	Total of water furnished during the thirty days, as per former account.
NOVEMBER.	Gallons.	Gallons.	Gallons.	Gallons.
1881	1,014,800	1,199,140	2,213,940	66,418,200
1882.........	1,166,734	1,202,029	2,368,763	71,062,890
1883.........	837,000	1,329,929	2,166,929	65,007,870

It will be seen by this that in November, 1881, with the pond at 11.62, or five feet three inches below high-water mark, the supply of water from unseen sources, by almost accurate measurement, was 1,199,140 gallons daily. In November, 1882, with the pond a little lower, at 10.95, or five feet eleven inches below high-water mark, the supply was 1,202,029 gallons per day; while in 1883, with the pond down almost five feet lower than in 1882, being at 6.10, the supply from unseen sources was only 1,329,929 gallons per day. The height of the water in the pond now is only about six inches above low-water mark in Boston harbor. You will notice that during the past year, while the pond has fallen 4.85 feet, so that we should think it would draw the water from a long distance from the ground flow under the surface, yet the increase per day from this source into the pond has only been 127,900 gallons, or about one-half hour's pumping.

We have made these calculations to meet remarks often made, that "Fresh Pond was inexhaustible," and that "it could never be pumped down below a certain point," and others of a similar nature. Of course we do not *know* but that it is inexhaustible, and can never, in the nature of things, *know for a certainty* until we had continued pumping until the last gallon was gone. But this we *do know*, that so far as we have gone there is no truth in these views, and no foundation for them outside of speculation; and therefore it becomes our duty, as well as only resort, to recommend the getting of an adequate water supply as soon as it can possibly be done.

Additional Water Supply.

We have now for three successive years applied to the Legislature for the right to take the waters of Shawsheen river; but the opposition has been so strong from the mill-owners that we did not succeed. In every case the committees of the Legislature have acknowledged our necessities, but, for reasons that seem to them good, have put us off by "reference to the next General Court." Last winter the argument against us was, that an equally good supply was to be had from Stony Brook at much less cost than Shawsheen. In connection with the City Engineer we made an examination of this source of supply; and, after becoming satisfied that the water was good, and an ample supply for our city for many years to come, we recommended that an application be made the coming session for the right to take that stream; which has been done. This stream and its tributaries cover a water-shed of some twenty square miles. It is in a sparsely settled country, and there are but a few factories on it, and these are small. We can learn of no opposition that is likely to arise to our taking this stream except from the town of Waltham and the mill-owners on the river below. It seems to us that our case is more pressing than theirs, and ought to prevail.

What Needs to be Done.

1. First of all, and most important of all, to get an additional water supply; and, if the Legislature grant us the right to take Stony Brook, we recommend that we proceed with all practicable haste to introduce it into Fresh Pond.

2. As soon as we have the necessary power to do so, we recommend that a careful survey be made of Fresh Pond, and so much land taken around its borders as will enable the city to control the same, and preserve the purity of the water, and prevent any further contamination.

3. We have determined on the extension of the high service to Dana Hill next spring, which can be done at a comparatively small cost, and thus furnish those living on that high land with a constant and abundant supply of water.

4. We recommend that an additional pipe of suitable size be laid up into the Belmont district, to furnish there a more abundant supply for domestic and fire purposes.

For the means to do these things, and for current expenses, we shall, in proper time, apply to your Honorable Body to make for us the necessary appropriations.

General Remarks.

It is important, in order that the true financial condition of the Water Works may appear from year to year, that the rates should be fixed, and, so far as is practicable, remain at a uniform price, where the conditions of the service rendered remain unchanged. We notice that the reduction in our revenue the past year, caused by the reduction of meter rates, is $11,285.93, and on hydrants, $3,065, — a total of $14,350.93. We do believe in reducing the water-rates to consumers as fast as we can do so safely; but, in any further action in this direction, it should be borne in mind that, if we succeed in getting the supply of water from Stony Brook, the necessary cost of it will increase our fixed charges at least $35,000 per annum. In regard to the large reduction on metered water made last year, whether this has been compensated for in any way the Council can judge as well as this Board. In regard to hydrants, when the original price of $30 was fixed, great care was taken to have it as low as the average of other cities. In 1875 it was reduced to $11, and remained five years; in 1880 it was again made $30; in 1881 and 1882 it was $15; while in 1883 it was made $10. We have a list of 28 towns and cities, nearly all in New England, where the rates for hydrants range from $20 to $60. The average is $35. We think, in fairness to this department of the city, the rates for our hydrants should be as high as the lowest of this list, to wit, $20 per annum, and allowed to remain at that price. Should that be done it would go well towards the reduction of water rates on $22 rate houses, which we are all agreed should have the benefit of the next reduction that is made in rates.

We wish to express our hearty thanks to the City Council for its cheerful coöperation with this Board in making the improvements about the pond this year. We fully believe that no appropriations ever made by the City Council were more needed, or have been better expended for the benefit of all our people, than that for cleaning out the pond, and shutting out by dams the low places which furnished so much vegetable matter to pollute the water. It has been the only redeeming feature of this extremely low stage of water, that it afforded us an opportunity such as we never had before to clean out and put in good condition our great natural reservoir.

There is a matter to which we called your attention a few years ago, to which we would again refer. At present our water rates are payable July 1, and if not paid within a short time thereafter the registrar is required, by an imperative order of the City Council, to shut off the water. July and August are months when a great many of our people are away on vacations, and it is not a convenient time for them to pay. By forgetfulness, and not from want of disposition or ability to pay, they find, upon returning home, or by information sent to their places of summer resort, that their water is cut off for non-payment of water rates. Not knowing, in some cases, that the registrar has no discretion in the matter, they at once make it a personal affair, and blame him for the inconvenience of shutting the water off, and the expense of letting it on again. We would refer you to the remarks of the registrar on this subject in his report to us. Again, it brings into our office and into the Treasurer's office a large amount of labor in midsummer, when, if at any time in the year, it is desirable to have the work as light as it is practicable to be. We would suggest that the water rates be made payable May 1, instead of July 1. After one year of interruption it would go on as now from year to year.

We cannot close this report without referring to our late President, who so long and faithfully served the city as a member of this Board. We miss his cheerful, kindly greeting and his valuable counsel. Perhaps we cannot do better than to record here the resolutions passed by the Board soon after his death, as follows: —

IN WATER BOARD, Sept. 28, 1883.

Whereas, The Honorable GEORGE P. CARTER, so long a member of this Board, and of late its President, has been suddenly removed by death, —

Resolved, That we, his late associates, desire to express our sense of the ability and fidelity with which he discharged the duties of his office; of his untiring and unselfish industry, for so many years, in the service of the city; of his inflexible integrity and honesty of purpose, which won for him the respect and confidence of his fellow-citizens, and of his kindly disposition and courtesy, which endeared him to those who knew him best.

Resolved, That the foregoing be entered upon the records of the Board, and that a copy thereof be sent to the family of the deceased, in token of our sympathy with them in their affliction.

Let us hope that, when our places become vacant, as much can be truly said of us.

All the officers employed by this Board have faithfully discharged their duties, during the past year, with the exception of our registrar, who has been confined to his house a large part of the time by sickness. While absent he has provided a substitute in the office, so far as possible to fill his place.

We herewith submit the Report of the Registrar and Superintendent, made to this Board, as a part of our report to you, for many details of interest in connection with the work.

As usual we have received assistance cheerfully rendered from the City Engineer and City Solicitor, to whom we would give due credit.

Respectfully submitted,

C. W. KINGSLEY,
JAMES M. W. HALL,
H. L. EUSTIS,
K. S. CHAFFEE,
L. M. HANNUM,
JAMES A. FOX,
GEO. H. HOWARD.

CAMBRIDGE, Dec. 16, 1883.

REPORT

OF THE

WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, December 13, 1883.

To the Cambridge Water Board: —

The undersigned herewith presents his eighth annual report, showing, as required by city ordinance, the receipts, expenditures, and abatements for the year ending November 30, 1883, together with a statement of the number of water-takers, fixtures, etc.

Amount of bills remaining unpaid Nov. 30, 1882: —

Water rates	$109 15	
Meter rates	38 18	
Supplies and repairs	1,002 26	
		$1,149 59

Amount of bills placed in hands of City Treasurer for collection, from Nov. 30, 1882, to Dec. 1, 1883: —

Water rates	$151,489 16	
Meter rates	32,065 79	
Supplies and repairs	5,563 86	
Off and on water, seals, fines, and rent	673 50	
		189,792 31
Total		$190,941 90

Deduct.	Abated.	Unpaid.	
Water rates	$3,010 98	$123 12	
Meter rates	45 63	37 32	
Supplies and repairs	13 80	498 46	
	$3,070 41	$658 90	3,729 31
			$187,212 59
Amount reported by City Treasurer as received by him			$187,212 59

Receipts.

Water rates	$148,464 21	
Meter rates	32,021 02	
		$180,485 23
Off and on water, seals, and fines	$529 50	
Rent of house at pipe-yard	144 00	
		673 50
Total rates, fines, etc.		$181,158 73
Supplies and repairs		6,053 86
Total		$187,212 59

Expenditures.

Construction account		$5,730 50
Supply account		4,028 74
Maintenance account, viz.: —		
Care and repairs	$13,807 91	
Pumping service	9,570 64	
Improvements at Fresh Pond	10,680 25	
New pumping service (pumps, engine, and building)	6,105 35	
New pumping service (salaries, coal, etc.)	764 01	
Office expenses	4,835 13	
		45,763 29
Total		$55,522 53

Abatements.

Water-rate bills to the amount of	$3,056 61
Supply and repair bills to the amount of	13 80
Total	$3,070 41

Charges for water rates on supplies afterwards shut off, or fixtures sealed, are necessarily abated before the books can be balanced. New charges are then made when the water is again let on.

Refunds.

Water rates have been refunded to the amount of	$1,123 34
Which amount, deducted from receipts	180,485 23
Leaves net receipts for water	$179,361 89
Add off and on, seals, fines, and rent	673 50
Makes net receipts of rates, fines, etc.	$180,035 39

Off and On.

Water has been shut off for non-payment of rates, or per order, on account of vacancy, and seals have been applied to fixtures by request of owners or occupants, as follows: —

Supplies shut off in 1883	401
Supplies let on, shut off in 1883	293
Supplies let on, shut off in previous years	52
New supplies let on	271
Seal-locks applied to fixtures in 1883	426
Seal-locks removed, put on in 1883	96
Seal-locks removed, put on in previous years	147

Statement of the yearly revenue received from water rates since the purchase of the works by the city: —

From	April 28, 1865,	to	Dec. 1, 1865	$32,367 19
"	Dec. 1, 1865,	"	1, 1866	40,073 27
"	" 1, 1866,	"	1, 1867	52,733 62
"	" 1, 1867,	"	1, 1868	63,747 42
"	" 1, 1868,	"	1, 1869	76,149 30
"	" 1, 1869,	"	1, 1870	92,606 95
"	" 1, 1870,	"	1, 1871	111,782 65
"	" 1, 1871,	"	1, 1872	127,201 30
"	" 1, 1872,	"	1, 1873	146,117 32
"	" 1, 1873,	"	1, 1874	153,634 27
"	" 1, 1874,	"	1, 1875	138,880 37
"	" 1, 1875,	"	1, 1876	179,166 76
"	" 1, 1876,	"	1, 1877	154,843 59
"	" 1, 1877,	"	1, 1878	157,443 91
"	" 1, 1878,	"	1, 1879	164,681 90
"	" 1, 1879,	"	1, 1880	173,325 49
"	" 1, 1880,	"	1, 1881	170,062 73
"	" 1, 1881,	"	1, 1882	177,430 80
"	" 1, 1882,	"	1, 1883	179,361 89

Comparative Statement.

	1882.		1883.	
Construction Account.				
Received				
Expended	....	$16,959 12	....	$5,730 50
Supply Account.			....	
Received	....	$3,832 51	....	$6,053 86
Expended	....	3,684 63	....	4,028 74
Excess of Receipts	....	$147 88	....	$2,025 12
Maintenance Account.				
RECEIVED.				
Rates, fines, etc.	....	$178,191 07	....	$180,033 39
EXPENDED.				
Care and repairs	$28,870 06	....	$45,763 29	
Interest on Water Debt	88,585 00	....	88,585 00	
Paid to Sinking-Fund Commissioners	44,355 00	161,810 06	44,355 00	178,703 29
Excess of Receipts	....	$16,381 01	....	$1,332 10
Supply Account, Excess of Receipts		$147 88	....	$2,025 12
Maintenance Account, Excess of Receipts		16,381 01	....	1,332 10
		$16,528 89		$3,357 22
Expended on Construction Account		$16,959 12		$5,730 50
Deduct Surplus as above		16,528 89		3,357 22
Excess of Total Expenditures over Total Receipts		$430 23		$2,373 28

Besides the manufactories, etc., supplied by meter, water is now supplied to 11,765 families, 797 stables, with 2,063 horses and 276 cows, 257 shops, 372 stores and offices, by the following fixtures, viz. : —

14,204 faucets.
3,856 wash-basins.
2,382 wash-tubs.
21 hopper-closets.
66 urinals.
60 yard-hydrants.

2,077 bath-tubs.
5,192 pan-closets.
775 slop-closets.
5 yard-fountains.
3 tumbler-washers.
1,012 hand hose.

Also, —

599 fire-hydrants (besides 4 on private premises).
14 fire reservoirs.
15 drinking-fountains in public squares.

The above is exclusive of the various school-houses, and other city buildings, for which special rates are charged, except where meters are located.

All premises supplied with Fresh-Pond water have been visited during the year, and a careful inspection made, to determine leaks and wastage.

If the members of the Board and of the City Council could hear but a small part of the harsh comments made by citizens upon the present time set for enforcing settlement of bills for water rates, they could not fail of being convinced that the date should be changed, so that water-takers would pay in May, rather than when they are preparing for, or are already enjoying, their annual summer vacation.

Repeated notices from the City Treasurer and the Registrar, stating the requirements of the City Ordinance, are ignored; and each enforcement is looked upon, even by business men, as a personal attack by the Registrar.

Extremely personal letters received, if gathered together, would make highly interesting reading, viewed by the light of the City Ordinance, which is obligatory upon the Registrar. The change suggested (and once recommended to the City Council by your Board) would evidently remove this substantial cause of annoyance to our citizens, and after the first year would run smoothly.

The Registrar's statement of the large amount accumulated from balances due, but unpaid, to the sinking-fund, and used for city purposes, although declared by the City Solicitor illegally so used, has been examined by the City Auditor, and brought up to Dec. 1, 1882.

It is now in the hands of the Committee on Finance of the City Council, to suggest a plan for settlement.

During the year the city has, by death, lost the services of Hon. **George P. Carter**, the President of the Board, and Wm. T. Raymond, Inspector.

In the death of President Carter each employee in the water office felt that he had lost a personal friend; his daily visits during his years of service, his pleasant, though close scrutiny of affairs, and strict impartiality, having made him such.

His expressions of satisfaction with the management and business transactions of the office are pleasant to recall, based, as they were, upon careful and constant supervision.

For a large part of the year the Registrar has been confined to his house by severe sickness, and the details of the office business have fallen upon the Assistant Registrar, Mr. Walter H. Harding. His carefulness and energy, aided by the various checks and balances adopted during the past few years, have kept the work well advanced, and at the close of the financial year its correctness has been proved by the figures embodied in this report.

With the approval of President Carter, Mr. E. H. B. Winnett was placed in the office as temporary assistant, and has very satisfactorily performed the duties assigned him.

With sincere thanks for the kindness and consideration shown me by the Board during my long sickness, this report is

Respectfully submitted,

J. WARREN COTTON,

Registrar.

REPORT

OF THE

COMMITTEE ON ACCOUNTS OF THE CAMBRIDGE WATER BOARD.

We have examined the abstract of accounts, as presented us by the Water Registrar, covering the records of the past year. We have compared these with the statements submitted to us by the City Treasurer and Auditor, and we find them to agree. Annexed, in brief, is the financial statement presented to us by the Water Registrar, and verified by us.

Amount of bills in hands of City Treasurer, Nov. 30, 1882: —			
For Water rates		$109 15	
Meter "		38 18	
Supplies and repairs		1,002 26	
			$1,149 59
Amount of bills delivered to City Treasurer for collection during the year ending Nov. 30, 1883: —			
For Water rates		$151,489 16	
Meter "		32,065 79	
Supplies and repairs		5,563 86	
Off and on, seals, and fines		529 50	
Rent of house at pipe-yard		144 00	
			189,792 31
			$190,941 90
Of these amounts the Treasurer has collected	$187,212 59		
Less refunded	1,123 34		
		$186,089 25	
Refunded as above		1,123 34	
Abated		3,070 41	
Balance uncollected, Nov. 30, 1883		658 90	
			$190,941 90

JAMES M. W. HALL, } *Committee*
GEO. H. HOWARD, } *on*
JAMES A. FOX, } *Accounts.*

DECEMBER, 1, 1883.

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DEC. 1, 1883.

Water rates unpaid, Nov. 30, 1882		$147 33	
Bills placed in hands of City Treasurer for collection, from Dec. 1, 1882, to Nov. 30, 1883:—			
Water rates from Fractional Ledger		14,390 56	
" " " Annual "		136,811 00	
" " " Meter "		32,065 79	
" " " Building account		287 60	
Off and on, rent, and fines		558 00	
Seals		115 50	
Total bills on rates, fines, etc.		$184,375 78	
Supply and repair bills unpaid Nov. 30, 1882	$1,002 26		
Supply and repair bills placed in the hands of City Treasurer for collection, Nov. 30, 1882, to Nov. 30, 1883	5,563 86		
		6,566 12	
Total bills			$190,941 90
There have been collected, Fractional Ledger		$13,516 57	
Annual "		134,660 04	
Meter "		32,021 02	
Building account		287 60	
Off and on, rents and fines		558 00	
Seals		115 50	
Total collections on rates, fines, etc.		$181,158 73	
Collection on supply and repair accounts		6,053 86	
Total collections		$187,212 59	
There have been abated, Water rates,	$3,056 61		
Supplies and repairs	13 80		
		$3,070 41	
Amount carried forward		$190,283 00	

Amount brought forward		$190,283 00	
There remain uncollected, Water rates,	$160 44		
Supplies and repairs .	498 46	658 90	
			$190,941 90

Total collections	$187,212 59	
Less refunds	1,123 34	
Total net receipts		$186,089 25

Attest: W. H. HARDING,
Asst. Registrar.

REPORT

OF THE

SUPERINTENDENT OF THE WATER WORKS.

CAMBRIDGE, December 10, 1883.

To the President and Members of the Cambridge Water Board: —

GENTLEMEN, — The annual report of your Superintendent, upon the condition of the Works and the operations of the past year, is herein presented.

The total amount of water pumped is 980,670,464 gallons. Coal consumed per million gallons pumped, 1,649 pounds.

Water sold by meter, and that used for watering streets, 257,095,625 gallons, leaving as the amount for domestic use 723,574,839 gallons.

Number of gallons daily for each inhabitant on whole amount pumped, 44.7 gallons.

Number of gallons daily for each inhabitant on amount for domestic use, 33 gallons.

Spy and Little Ponds, Wellington Brook and Conduit.

The pipe connection between Spy and Little Ponds has not been used during the year. The water has been analyzed with the usual result, — "Not fit for domestic use." The gate-house and gate are in good condition.

Little Pond, during the past season, has contained a large amount of the weed known as clathrocystus, and no water has been drawn directly from this source. The filter-basin appears to be in good condition. The gates were opened, and water taken from this source, from January 24 to April 13. The height of the water in Little Pond was 15.30, Fresh Pond 9.55, at the time the gates were opened. The condition of Wellington Brook remains the same as at the date of my last report. Water was drawn from this source from January 24 to April 13, at which time the water was deemed unfit for use, and the gates were closed. The conduit has been inspected from Wellington Brook to Fresh Pond. Two places were found near Fresh Pond where it had settled and drawn apart two inches; these have been repaired, and the conduit is now in good condition its entire length.

Fresh Pond.

Owing to the low state of the water in Fresh Pond a large amount of work has been done on its borders, and many much-needed improvements have been made. The mud has been removed, and banks built, on the south and west shores, and the slopes of the banks have been covered with stone. Dams have been built across Eames', Bright's, and Gay's Nooks, which cut off three very objectionable sources of pollution. Black's Nook now remains, and when that is cut off Fresh Pond will be comparatively free from impurities caused by decayed vegetable matter, with which the nooks have been filled. The rip-rapping on the east shore, near the engine-house, has been thoroughly repaired.

The water in Fresh Pond reached its highest point April 14, viz., 11.93; and its lowest, November 26, 5.91. The centrifugal pump, on the border of the pond, was started August 27, the water in the pond being drawn down to grade 7.66, which is one foot and eight inches below the inside of the top of the conduit, or 9.19 feet below high-water mark. As there was no duplicate to this pump, in case of accident, and no prospect of the pond filling up for many months to come, a wharf has been built farther out in the pond, and a house built thereon. Two Follansbee propeller-pumps, together with a 40 horse-power engine and boiler, built by the Atlas Works of Indianapolis, Indiana, have been purchased, and put in position. By this arrangement the water can be drawn to a depth of feet lower than its present height, which is three feet and two inches below top of conduit. The new pump was started, for regular duty, November 28.

Pumping Works.

The engine-house lot and Tudor Park have received the necessary care, the grass cut and walks graded. I would recommend that a suitable fence be built around both of the above lots. No repairs have been needed on the engine-house or coal-sheds during the year. The Engineer's report, appended, shows the condition of the engines and boilers, and repairs on the same.

Reservoir.

The retaining-wall of the reservoir from the gate-house, on the east side, to and on Highland and Reservoir streets, to within one hundred feet of the north-west corner, has been thoroughly pointed. There does not appear to have been much, if any, movement of the high wall on Reservoir street the past year. I think it should receive the necessary repairs in the spring. The walks and banks have received the usual care. I would again call your attention to the necessity of a separate house for the chronograph, in order to keep continued and perfect records of the night consumption.

High Service.

No extension of the high service has been made during the past year. I think the time has come when it should be extended to Dana Hill, as in business hours it is impossible to maintain a pressure above what the reservoir will give, which is not sufficient to fill the tanks on this hill. This extension can be made by using the old 12-inch main from the reservoir to the flag-staff in Harvard square, then laying an 8-inch main to Quincy street, there connecting with the 6-inch main now laid; also laying 800 feet of 4-inch in Chatham street, and putting in the necessary check-valves.

No repairs whatever have been made on the high service since it was put in operation, in June, 1882.

Main Pipe.

Main pipe has been laid in the following streets: 96 feet of 4-inch in Banks street, 189 feet of 1¼-inch in Potter street, 509 feet of 4-inch in Chestnut street, 97 feet of 6-inch in Fifth street, 457 feet of 6-inch in Larch street, 658 feet of 12-inch in Portland street, 156 feet of 4-inch in Spring street, 885 feet of 8-inch in Cushing street, 86 feet of 6-inch in Magazine street, 309 feet of 4-inch in Brewster court, 347 feet of 4-inch in Hadley street, 136 feet of 1½-inch in Foster-street court, 88 feet of 4-inch in Lancaster street, 73 feet of 4-inch in Frost street, 139 feet of 2-inch in Van Brunt's driveway off Brattle street, 69 feet of 1-inch in Austin street, 54 feet of 1-inch in Holworthy court, 261 feet of 2-inch in Lawn street, 106 feet of 1-inch¼ in Norton place, 56 feet of 1½-inch in Otter street: 130 feet of 6-inch pipe have been lowered in Foxcroft street, on account of change of grade in street. All of the gates have been inspected and their locations marked.

New Supplies.

Two hundred and eighty new supplies have been laid during the year, making, at this date, a total of 8,004. Nineteen old supplies have been renewed, and seventy-three have been furnished with sidewalk shut-offs.

Leakage.

One hundred and two leaks have been stopped: one on 20-inch cement pipe, two on 10-inch iron pipe, four on 8-inch, six on 6-inch, eleven on 4-inch, six on 3-inch, two on 1½-inch, forty-five on supplies in the street, and twenty-five on supplies on premises. All of the house-fixtures have been inspected once during the year, and the low and marsh territories twice. All of the main pipe on filled and marsh land has been shut off in sections, and tested in the night for leaks.

Our November record of this year, of water pumped, shows a very favorable condition of the Works in regard to leaks. The pumping record of November of this year compared with that of last year shows a decrease of 204,000 gallons daily for the month.

Brookline-street Bridge.

No repairs have been made on the bridge during the year. It appears to be in good condition. The siphon was pumped out in November.

Hydrants.

Five new post hydrants have been set during the year, all in new locations, excepting one at Garfield and Oxford streets.

Two flush hydrants have been removed, viz.: Garfield and Oxford streets, and at Soden street and Western avenue.

The present number is 265 post, and 334 flush.

Pipe-Yard.

The building at the pipe-yard is in good condition; the stable will need painting the coming year.

Accompanying this report is that of the Engineer at the pumping station, and tables showing the monthly amount of water pumped, the Fresh-Pond record of water heights; the locations of fountains, stand-pipes, and meters; the details of main and supply extensions, and the amount of stock on hand.

Respectfully submitted,
HIRAM NEVONS,
Superintendent.

List of Meters in Use, Nov. 30, 1883.

METERS.	Locality.	Size.	Description.
		Inch.	
Alghieri, Simon	Main st.	⅝	Worthington.
Andrews, D. H.	Sixth st.	1	Crown.
American Rubber Co.	Potter st.	4	"
American Rubber Co.	Potter st.	6	Gem.
American Net and Twine Co.	Third st.	2	Worthington.
American Steam Safe Co.	Main st.	1	"
American Steam Safe Co.	Main st.	1	Crown.
Bay State Brick Co.	Spruce st.	1	"
Berry, Casper	Elm st.	1	"
Bird, H. M.	Broadway	1½	Worthington.
Boston Woven Hose Co.	Broadway	1¼	"
Boston Stamping Co.	Third st.	2	"
Boston & Lowell R. R. (Repair Shop)	Bridge st.	2	"
Boston & Lowell R. R. (Round House)	Prison Point st.	2	"
Boston & Lowell R. R. (Paint Shop)	Prison Point st.	1	"
Boston & Lowell R. R. (Round House)	Prison Point st.	2	"
Boston & Lowell R. R. (Car House)	Prison Point st.	2	"
Boston & Lowell R. R. (Filling Locomotives)	Prison Point st.	6	Union Rotary.
Bullock, O. H.	Broadway	1	Worthington.
Burton, A. & E., & Co.	Harvard st.	⅝	"
Carr Bros.	Lopez st.	1	"
Capen, Sprague & Co.	Sixth st.	2	"
Cambridgeport Diary Co.	Magazine st.	1	"
Cambridge Gas Light Co.	Third st.	1½	Crown.
Cambridge Gas Light Co.	Ash st.	¾	Worthington.
Campbell Bros.	Main st.	¾	"
Charles River Railroad Co.	Brookline st.	¾	"
Charles River Railroad Co.	Hampshire st.	½	Desper.
Charles River Railroad Co.	Palmer st.	¾	Worthington.
City of Cambridge (Shepard School)	North ave.	2	"

List of Meters in Use, Nov. 30, 1883. — *Continued.*

METERS.	Locality.	Size.	Description.
		Inch.	
City of Cambridge (Ward 1 Building)	Brattle sq.	2	Worthington.
City of Cambridge (Ward 4 Building)	Central sq.	1½	"
City of Cambridge (Cemetery)	Coolidge ave.	4	"
City of Cambridge (Almshouse)	Tannery st.	2	"
City of Cambridge (Webster School)	Upton st.	2	"
Cushman Bros.	Main st.	⅝	Desper.
Close, George	Broadway	1	Worthington.
Clark, B. P., & Co.	Main st.	1	"
Cochrane, A., & Co.	Potter st.	1	Crown.
Coleman, John, & Son	Broadway	1	Worthington.
Cooper's Car Wheel Co.	Hampshire st.	½	Desper.
Cofran, S. M.	Concord ave.	1½	Worthington.
Coolidge, J. G. (Barn and Grounds)	Coolidge ave.	2	"
Coolidge, J. G. (Greenhouses)	Coolidge ave.	1	"
Daniels, Badger & Co.	Thorndike st.	½	Desper.
Davis, Curtis, & Co.	Broadway	1½	Worthington.
Davis, J. C., & Son.	Broadway	1	"
Davenport, A. H.	Cambridge st.	2	"
Dailey, C. W.	Cambridge st.	1	"
Derby, H.	Main st.	1	Crown.
Downing, Theo.	Eustis court	1	Worthington.
Draper, F., & Co.	Otis st.	⅝	Desper.
De Rosay, L. E., & Co.	Dublin st.	⅝	Worthington.
Dow, Wm. H.	Portland st.	2½	Crown.
East Cambridge Club Stable	First st.	1	Worthington.
Eastern Dredging Co.	Western ave.	2	"
Eames, J. H., & Co.	Pacific st.	1	"
Ela Bros.	Broadway	2	"
Elastic Paint Co.	Third st.	⅝	Crown.
Episcopal Seminary	Brattle st.	1½	Worthington.
Farrell & Stetson	Frank st.	⅝	Desper.
Fenton, N., & Co.	Gore st.	⅝	"
Geldowsky, F., Furniture Co.	Otis st.	1	Worthington.
Gilmore & Eustis	Portland st.	2	"
Goepper Bros.	Ninth st.	1½	"
Greely, Leander	Broadway	1	"
Griffin & Dolan	Decatur st.	⅝	Desper.
Harvard College (Holworthy)	College Grounds	⅝	Worthington.
Harvard College (Boylston)	College Grounds	2	Crown.
Harvard College (Stoughton)	College Grounds	⅝	Worthington.
Harvard College (Sever)	Quincy st.	⅝	Crown.
Harvard College (Thayer)	Cambridge st.	1½	Worthington.
Harvard College (In Yard)	College Grounds	1½	"
Harvard College (Memorial Hall)	Cambridge st.	2	"
Harvard College (Boat-House)	Flagg st.	⅝	Desper.
Harvard College (Botanic Garden)	Garden st.	1	Worthington.
Harvard College (Gymnasium)	Cambridge st.	1	"
Harvard College (Holyoke)	Harvard st.	2	"
Harvard College (Museum Comp. Zoölogy)	Divinity ave.	1	"
Harvard College (Scientific School)	Kirkland st.	⅝	Desper.
Harvard College (Law School)	Holmes pl.	⅝	Worthington.
Harvard College (Jeffersonian Phy. Lab'y)	Kirkland st.	⅝	"
Hilton, J. M.	Harvard st.	1½	Crown.
Hazlett, W. H., & Co.	Otis st.	1½	Worthington.
Hews, A. H., & Co.	Crescent ave.	1	Worthington.
Hixon, Edw., & Co.	Main st.	⅝	Ball & Fitz.
Houghton, H. O., & Co.	Blackstone st.	2	Worthington.
Hovey & Co.	Cambridge st.	1	"
Howe & Putney	Distillhouse st.	1	"
Ivers & Pond	Albany st.	⅝	Ball & Fitz.
Jones, C. L., & Co.	Pearl st.	⅝	Worthington
Kemp, Lysander, & Sons	Davis st.	1	"
Kennedy, F. A., & Co.	Green st.	1½	"
Kendall & Roberts	Main st.	⅝	"
Low, J. W.	Reed st.	1½	"
Loan, John J.	Columbia st.	⅝	Union.
Little, Brown & Co.	Blackstone st.	⅝	Ball & Fitz.
Lamb & Ritchie	Albany st.	1	Crown.
Mason & Hamlin	Broadway	1	Worthington.
Middlesex Bleachery & Dye Works	Sacramento pl.	1½	"
Middlesex County (Court-House)	Thorndike st.	⅝	Desper.
Middlesex County (House of Correction)	Thorndike st.	2	Worthington.
Middlesex County (Court-House)	Otis st.	⅝	"

List of Meters in Use, Nov. 30, 1883. — *Continued.*

METERS.	Locality.	Size.	Description.
		Inch.	
Middlesex County (Registry of Deeds)	Otis st.	½	Worthington.
Millan, Alex	Brattle st.	[illegible]	Desper.
Moore, Chas	Farwell pl.	1	Worthington.
Moring, Mrs. A. L	Main st.	1	"
Mt. Auburn Corporation (Greenhouse)	Brattle st.	1	"
Mt. Auburn Corporation (Cemetery)	Mt. Auburn st.	[illegible]	Desper.
Murdock, W. H	Griggs st.	[illegible]	"
New England Glass Co	North st.	[illegible]	Worthington.
Norton, Edw. H	Winsor st.	[illegible]	Desper.
North, C. H., & Co	Conlan court	1	Worthington.
O'Brien, J. F	Coolidge ave.	[illegible]	"
Page, Geo. G., Box Co	Hampshire st.	2	"
Parry Bros. & Co	Raymond st.	1	"
Pike, Joel, & Co	Church st.	1	"
Pike, Joel, & Co	Palmer st.	[illegible]	"
Porcellian Club	Harvard st.	[illegible]	Crown.
Porter's Hotel	North ave.	1	Worthington.
Ross, Mrs. H. P	Broadway	[illegible]	"
Reardon, John, & Sons	Waverly st.	4	"
Reardon, Wm	Portland st.	2	Crown.
Revere Sugar Refinery (South side)	Water st.	3	Worthington.
Revere Sugar Refinery (North side)	Water st.	3	Union.
Reversible Collar Co	Mt. Auburn st.	1	Worthington.
Rideout, M. E., & Co	State st.	1	"
Rideout, M. E., & Co	Sands st.	1	"
Roberts, O. P	Brattle st.	1	"
Rogers, Geo. M.	Washington st.	3	"
Robinson, J. P., & Co	Main st.	1	Crown.
Russ Moulding Co	Thorndike st.	[illegible]	Desper.
Russell & Zerega	State st.	[illegible]	Worthington.
Rutherford & Dugan	First st.	1	Crown
Sargent, Dr. D. A	Palmer st.	1	Ball & Fitz.
Shorey, Geo. L	Soden st.	2	Worthington.
Sands, M. W	Walden st.	[illegible]	"
Shaw & Applin	Bridge st.	1½	"
Smart, D. C	Main st.	2	"
Sortwell & Co	Distillhouse st.	2	"
Squire, J. P., & Co	Gore st.	4	"
Squire, J. P., & Co	Gore st.	1	"
St. Mary's Church	Norfolk st.	2	"
Tower, Sylvester	Broadway	2	"
Tug "H. Chapel"	First st.	1½	Crown.
Thurston & Hall Biscuit Co	Elm st.	[illegible]	Desper.
Teele, Frank H	Lincoln court	[illegible]	Worthington.
Thayer, Henry, & Co	Broadway	2	"
Tribune Publishing Co	Linden st.	[illegible]	Desper.
Tracy, M. F	Brighton st.	1	"
Uhrig, Jos	Main st.	1½	"
Union Railway Co. (Washing Cars)	Dunster st.	1	Worthington.
Union Railway Co. (Repair Shop)	Dunster st.	1	"
Union Railway Co. (Car-house)	Dunster st.	1	"
Union Railway Co. (Wooden Stable)	Dunster st.	1	"
Union Railway Co. (Brick Stable)	Dunster st.	1	"
Union Railway Co. (Brick Stable)	Cambridge st.	[illegible]	"
Union Railway Co. (Stable)	Cambridge st.	1	"
Union Railway Co. (Stable)	Cambridge st.	1½	Boston.
Union Railway Co. (Stable)	Baldwin st.	1	Worthington.
Union Railway Co. (Stable)	Camb. & Bald st.	1	Desper.
Union Railway Co. (Stable)	Mt. Auburn st.	1	Worthington.
Union Railway Co. (Stable)	Main st.	2	"
Union Railway Co. (Stable)	North ave.	2	"
Union Railway Co. (Stable)	River st.	1	"
Union Railway Co. (Stable)	Murray st.	1½	"
Union Railway Co. (Washing Cars)	Murray st,	1½	Crown.
Union Glass Co. (Pot Room)	Webster ave.	[illegible]	Worthington.
Union Glass Co. (Packing Room)	Webster ave.	[illegible]	"
Warren, J. H. (Felton Hall)	Cambridge st.	1	"
Wellington, J., A. & Co	Fifth st.	1	"
Whitney, Horace W	Main st.	[illegible]	Crown.
Wilson, John, & Son	Brattle st.	1	Worthington.
Woodbridge, S. F	Frank st.	[illegible]	"
Wight & Scorgie	Mt. Auburn st.	[illegible]	Desper.

List of Drinking-Fountains, Nov. 30, 1883.

Bridge street, junction of Cambridge street.
Broadway, south-west corner of Norfolk street.
Brattle square, east side of Brewer's Block.
Brattle street, junction of Fresh Pond lane.
Cambridge street, south corner Fifth street.
Central square, west side.
Central square, east side.
Hampshire street, junction of Broadway.
Harvard square, at the flag-staff.
Inman square, east side.
Main street, junction of Broadway.
Main street, junction of Mt. Auburn street.
North avenue, south-west corner of Walden street.
North avenue, north side, west of Cameron street.
Putnam avenue, south-west corner of Pearl street.

List of Stand-pipes, for Street Watering, Nov. 30, 1883.

Brattle street, near University Press.
Brattle street, corner Sparks street.
Brattle street, near Fayerweather street.
Brattle street, near Fresh Pond lane.
Bridge street, junction of Cambridge street.
Broadway, near Third street.
Broadway, corner of Sixth street.
Broadway, corner of Winsor street.
Broadway, junction of Hampshire street.
Brookline street, corner of Putnam avenue.
Cambridge street, near Warren street.
Cambridge street, near Winsor street.
Cambridge street, at Inman square.
Columbia street, near Austin street.
Concord avenue, at junction of Garden street.
Dana street, at corner of Chatham street.
Gore street, west of Third street.
Green street, near Western avenue.
Harvard street, corner of Prescott street.
Inman street, near Broadway.
Kirkland street, near Quincy street.

Main street, near Portland street.
Main street, near Hancock street.
Magazine street, opposite Warland street.
Mt. Auburn street, near Athens street.
North avenue, near Common.
North avenue, corner of Sacramento street.
North avenue, near Roseland street.
North avenue, near Beech street.
North avenue, near Spruce street.
North avenue, corner of Norris street.
North avenue, opposite Tannery street.
Prison Point street, opposite Round House.
River street, near Putnam avenue.
Sixth street, near Thorndike street.
Third street, near Rogers street.
Thorndike street, near Third street.
Western avenue, near Howard street.

Main Pipe laid, Number of Gates and Fire-Hydrants.

LOCATION.	IRON PIPE.		GATES.		FIRE-HYDRANTS.	
	Length.	Size.	No.	Size.	No.	Size.
	Feet.	Inch.		Inch.		Inch.
Banks street	96	4				
Potter park	189	1½				
Chestnut street, north from Magazine	355	4	1	4		
Chestnut street, south from Sidney street	154	4	1	4		
Fifth street	97	6	1	6		
Larch street	457	6	1	6		
Portland street	658	12	1	12	1	5
Spring street	156	4				
Cushing street	885	8	1	8	1	5½
Otter street	56	1½				
Magazine street	86	6				
Brewster court	309	4	1	4		
Hadley street	347	4	1	4		
Foster-street court	136	1½				
Lancaster street	88	4				
Frost street	73	4				
Van Brunt's Driveway, off Brattle street	132	2				
New street, off Meacham street	193	4				
Austin street	69	1				
Norfolk street, 300 feet, north of Broadway	......	......	......	......	1	5
Western avenue, opposite Soden street	......	......	......	......	1	5
Holworthy-street court	54	1				
Lawn street	261	2				
Norton place	106	1½				
Third and Spring streets	......	......	1	4		
Third and Vine streets	......	......	1	4		
Garfield and Oxford streets	......	......	......	......	1	5
Ash-street court	50	4				
Bath street	50	4				
First street	12	6				
Blake street, at North avenue	......	......	1	6		

List of Check-Valves.

Location.	Size.
	Inch.
Lake View avenue, 150 feet north from Huron street	10
Lake View avenue, 150 feet north from Brattle street	6
Fayerweather and Reservoir streets	6
Sparks street, opposite Dr. Wyman's stable	6
Concord avenue, 135 feet south from Buckingham street	6
Buckingham street, 220 feet west from Concord avenue	6
Garden and Linnæan streets	6
Raymond and Linnæan streets	6
Avon Hill and Linnæan street	6
Arlington street, 230 feet west from North avenue	6
Mt. Vernon street, 100 feet west from North avenue	6
Mt. Pleasant street, 150 feet south from Walden street	6

Recapitulation.

	12 in.	10 in.	8 in.	6 in.	4 in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	Totals.
Length of iron pipe	658	......	885	652	1871	400	192	295	113	....	5,066
Number of gates	1	......	1	4	6	....	......	......	....	....	12
Number of hydrants	......	......	....	....	....	....	......	......	....	....	5
Number of check-valves	......	......	....	....	....	....	......	......	....	....	....

New Supplies.

GALVANIZED PIPE AND BRASS FITTINGS USED FROM DEC. 1, 1882, TO NOV. 30, 1883, INCLUSIVE.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	Total.
Length of galvanized pipe	853	112	1,044	2,171	8,981	13,161
Number of supplies	6	2	9	16	247	280
Number of stops and wastes	6	2	9	15	249	281
Number of screw cocks	4	3	8	15	222	252
Number of sidewalk cocks	....	....	....	14	258	272
Number of sidewalk stand-pipes	....	....	....	....	....	253
Number of boxes, frames, and covers	....	....	....	....	....	12

Statement of Stock on Hand, Dec. 1, 1883.

FOR STREET MAINS (IRON PIPE AND FITTINGS).

NUMBER OF	48 in.	30 in.	24 in.	20 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Straight pipe (12 ft. ea.)	2	25		17		14	17	7	8	18	
Elbows			1	2	2	1	2		1	14	
Bends		1	2			1	3	3	5	1	
Y branches			1			1-24"					
Sleeves		1	5	8	2	8	8	2	4	6	6
Clamp sleeves			6	5	1	4	7	8	4	7	4
Drain offsets									15		
Offsets							6		8	4	
Gates						1	1		3	3	
Check-valves			2						1		
Blow-off branches				2-6"							
Caps						8	4		8	6	
Clamps with cocks for cement pipe							2	2	4	6	
T's		3"									1
		4"				2			2	12	
		6"	3	4	3	4	2	9	9		
		8"	1	1		1	2	3			
		10"		1			1				
		12"		1							
		16"	1								
		20"		2							
		24"	1	1							
Crosses		3"									2
		4"				6		1	7	17	
		6"			1	8	18	1	6		
		8"					1		5		
		10"		2		7	1				
		12"			1						
		20"		1							
Reducers		4"							8		
		6"			1	1	3	4			
		8"		2		4					
		10"	1								
		12"						1			

FOR SUPPLIES (GALVANIZED PIPE AND BRASS FITTINGS).

	2½ in.	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
Number of feet galvanized pipe	16	320	112	238	544	736	
Elbows		29	4	30	12	55	20
Street elbows					16	35	
Couplings	2	32	25	25	34	30	85
Unions for lead pipe						14	
Unions		39	4	12	50	54	14
Faucets					13	12	12
Stops and wastes		3	8	4	4		
Screw cocks		3	10	24	2	36	
Sidewalk cocks						3	
Screw cocks for cement-pipes					24	20	
Blow-off cocks			2				
Hose bibs						27	
Air-chambers					41	7	38
Socket end of root						81	
Nipples		80	20	47	12	285	3
Plugs			14	14	25	37	
Bushings, 93 from 2 in. to ½ in.							
Fountain cocks						8	
Hydrant cocks						12	
Sill cocks						11	
Hose nipples						20	
Corp. cock				4			
Soldering nipples						20	
T's				20	24	77	
Cast-iron T's		25	100	90	100	400	
Crosses		70	110	90	80	30	
Caps		7		5	8	5	20
Reducing couplings 12 from 2 in. to 1½ in.							

Stock in Shop and in Yard.

3 hydrant valves.
9 bolts for flush hydrants.
3 stop and wastes for flush hydrants.
3 lead kettles, and furnaces.
2 screws for raising main pipe.
3 bench vises.
3 drinking-fountains.
8 different size bands for capping main pipe.
2 hydrant boxes.
7 small gate boxes.
28 large gate boxes.
4 2-inch cock boxes.
3 large frames and covers.
90 risers for gate and hydrant boxes.
134 seals.
3 gross nuts.
1 axe.
4 sledge hammers.
12 gallons oil.
1 pair rubber boots.
½ cord wood.
50 feet three-fourths inch hose.
1 cask cement.
8 screw-drivers.
6 piles.
1 square.
2 saws.
1 plane, compasses, etc., for carpentering.
A lot of counters and ratchet movements for meters.
3 four-inch spindles.
1 three-inch spindle.
9 six-inch spindles.
4 horses.
6 wagons.
4 harnesses.
1 sleigh.
1 pung.
1 double-runner sled.
6 blankets.
1 buffalo-robe.
2 oil covers for horses.
18 caps for meters.
1 three-inch Worthington meter.
2 two-inch Worthington meters.
1 one-inch Worthington meter.
2 three-fourths Worthington meters.
2 one-inch Crown meters.
1 three-fourths inch Crown meter.
4 five-eighths inch Desper meters.
1 one-inch Union Rotary meter.
1 three-fourths inch Union Rotary meter.
1 one and one-half inch Boston meter.
1 three-fourths inch Equitable meter.
1 lathe, with the usual chucks and tools.
1 water meter.
1 threading machine, with dies complete.
1 drilling machine, with drills complete.

2 tapping machines for supplies with taps and drills.
2 two-inch taps and drills.
2 hooks for tapping pipes.
1 breast drill.
1 ratchet for tapping pipe.
1 machine for tapping cement pipe, complete.
1 gig saw.
1 washer-cutter.
1 platform scale.
2 grindstones.
1 large hand pump.
8 thawing pumps.
150 feet thawing-out pipe.
1 hay-cutter.
1 large boom derrick.
3 small derricks.
1 breast derrick.
12 pipe wrenches.
2 nut wrenches.
3 monkey wrenches.
7 pipe-cutters.
7 pair tongs.
2 sets main pipe tools.
3 blow-off wrenches.
3 two-inch cock wrenches.
2 one and one-fourth inch wrenches.
3 hydrant wrenches.
8 oil-cans.
8 die plates, with dies complete, from 2 inch to ½ inch.
8 keys to garden hydrants.
4 tool-chests.
2 handcarts.
4 chains.
40 shovels.
30 picks.
9 trench rammers.
2 paving rammers, with tools.
5 pails.
4 bars.
30 wheelbarrows.
4 tamping bars.
17 lanterns.
1,400 lbs lead.
35 lbs. packing.
2 hydrant bodies.
6 flush hydrants in good repair.
25 flush hydrants out of repair.
2 flush hydrant frames.
29 flush hydrant covers.
6 garden hydrants.
2 post hydrants.
16 post hydrant rods.

REPORT

OF THE

ENGINEER OF THE PUMPING STATION.

PUMPING STATION, CAMBRIDGE WATER WORKS,
Dec. 1, 1883.

Hiram Nevons, Esq., Superintendent: —

SIR, — I would report the engines and boilers in good condition. During the past year No. 1 engine has had valves and valve-seats refaced, new valve-stems fitted, copper joints made on steam-chests and covers, Tripp's metallic packing fitted to low-pressure piston-rods in internal heads, lagging around cylinders and steam-chests repaired, rubbed down and oiled; the sulphur has been removed from under air-pumps, and replaced with Portland cement. The auxiliary engine and centrifugal pump, at the pond, were started August 27, and ran until November 28, when they were stopped, and the new engine and Follansbee propeller pumps, put in this season, were started. When the portable engine is in position, in the new building, we shall have two sets of machinery, either of which will be capable of pumping five million gallons daily.

Following will be found a statement of the expenses at the pumping station, with the engine record, pond levels, and rainfall.

E. C. BROOKS,
Engineer.

Expenses.

400 tons Cumberland coal, @ $6.30	$2,520 00
$12\frac{896}{2240}$ tons Cumberland coal, @ 6.44	79 86
$309\frac{925}{2240}$ tons Cumberland coal, @ 5.29	1,639 16
Oil, waste, packing, etc.	218 53
Repairs on engines and boilers	619 43
Repairs on buildings and care of grounds	71 39
Salaries	3,510 00
Total	$8,658 37

Engine Record, Pond Levels, and Rainfall.

Date.	Low-Service Engines.						High-Service Engines.						Total water pumped.	Daily average water pumped.	Total coal consumed.	Daily average coal consumed.	Av ge height of pond.	Rainfall.
	Total pumping time.		Daily average pumping time.		Total water pumped.	Daily average water pumped.	Total pumping time.		Daily average pumping time.		Total water pumped.	Daily average water pump'd.						
	Hrs.	Min.	Hrs.	Min.	Gallons.	Gallons.	Hrs.	Min.	Hrs.	Min.	Gallons.	Gallons.	Gallons.	Gallons.	Lbs.	Lbs.	Feet.	Inches.
December, 1882....	361	35	11	40	78,304,800	2,525,961	361	35	11	40	1,967,117	63,455	80,271,917	2,589,417	147,200	4,748	10.40	1.87
January, 1883....	395	15	12	45	88,759,800	2,863,219	395	15	12	45	2,161,862	69,737	90,921,662	2,932,956	153,400	4,948	9.75	2.94
February, "	338	05	12	04	76,661,700	2,804,175	338	05	12	04	1,855,200	66,257	78,516,900	2,804,175	129,700	4,632	10.12	2.85
March, "	382	05	12	20	81,996,300	2,645,042	382	05	12	20	2,070,874	66,802	84,067,174	2,711,844	144,800	4,671	11.33	1.76
April, "	334	35	11	09	72,052,200	2,401,740	334	35	11	09	1,747,738	58,258	73,799,938	2,459,998	125,700	4,190	11.76	2.48
May, "	371	50	12	....	84,933,900	2,739,803	371	50	12	....	2,066,707	66,668	87,000,607	2,806,471	138,400	4,465	11.22	4.10
June, "	387	05	12	54	91,250,400	3,041,680	387	05	12	54	2,646,912	88,230	93,897,312	3,129,910	143,400	4,780	10.53	2.28
July, "	409	45	13	13	91,825,800	2,962,123	409	45	13	13	3,018,413	97,368	94,844,213	3,059,491	146,600	4,729	9.38	2.38
August, "	392	45	12	40	86,325,300	2,784,687	392	45	12	40	3,094,368	99,818	89,419,668	2,884,501	146,200	4,716	8.11	0.34
September, "	332	05	11	04	70,676,400	2,355,880	332	05	11	04	2,287,814	76,260	72,964,214	2,432,140	118,100	3,937	6.98	1.18
October, "	320	55	10	21	67,816,500	2,187,629	320	55	10	21	2,142,490	69,113	69,958,990	2,256,742	114,900	3,706	6.47	5.61
November, " ...	302	50	10	04	62,858,400	2,096,280	302	50	10	04	2,119,469	70,649	65,007,869	2,166,929	109,300	3,643	6.10	1.96
Total..........	4,328	50	....	....	953,491,500	....	4,328	50	....	....	27,178,964	....	980,670,464	....	1,617,700	....	......	29.75
Daily average..	11	52	....	....	2,612,305	....	11	52	....	....	74,463		2,686,768	....	4,432	....	9.35	

Stock on Hand, Dec. 1, 1883.

591$\frac{1214}{2240}$ tons Cumberland coal; 32 gallons cylinder oil; 24 gallons engine oil; 40 gallons kerosene; 20 pounds cotton waste; 50 pounds rubber packing; 5 pounds asbestos packing; 10 pounds American packing; ¼ bale flax packing; 2 cylinder-head gaskets; 24 9-inch rubber valves; 2 valve seats; 2 steam gauges; 10 pounds Babbitt metal; 1 pound solder; 1 pound red lead; 5 pounds sheet brass; ½ bale hair felt; 40 pounds soap; 1½ barrels fire clay; ½ barrel cement; 15 feet 5-inch rubber belting; 5 files; 1½ pounds emery; 6 gauge-glasses; 6 lamp-chimneys; 3 dozen lamp-wicks; 2 lantern globes; ¼ barrel brimstone; 300 pounds bolts and nuts; 10 pounds nails; 1 pair plungers and rings for No. 2 engine; 20 feet 2-inch brass pipe; 7 feet ½-inch brass pipe; 40 feet 3-inch iron pipe; 40 feet 1¼-inch iron pipe; 30 feet ¾-inch iron pipe; 2 1½-inch globe valves; 1 lot pipe fittings, assorted sizes; 10 feet 24-inch flange pipe; 8 feet 6-inch flange pipe.

Tools, Furniture, and Instruments.

1 18-inch × 10 feet engine lathe; 2 lathe chucks; 6 lathe dogs; 18 lathe tools; 1 grindstone; 1 3-inch × 9 inch engine; with shafting, belting, etc.; 2 vises; 1 vise bench; 1 set pipe dies; 1 set pipe taps; 1 set hand taps; 2 pipe cutters; 14 pairs pipe tongs; 2 hand hammers; 1 copper hammer; 18 cold chisels; 10 files; 1 hand bellows; 6 screw wrenches; 2 Stillson wrenches; 22 fork wrenches; 27 socket wrenches; 1 hydrant wrench; 6 gate wrenches; 2 clamp screws; 1 sledge; 2 ratchets; 24 drills; 1 breast drill; 2 jackscrews; 6 steel bars; 2 soldering irons; 4 cylinder-head cranes; 12 eyebolts; 75 starting bolts; 2 starting keys; 1 chain fall; 1 level; 1 gasket cutter; 2 ladles; 4 wooden horses; 1 oil cabinet; 1 set measures; 1 10-gallon can; 1 6-gallon can; 3 3-gallon can; 3 1-gallon cans; 2 lamp-fillers; 2 funnels; 4 squirt cans; 1 oil pump; 1 carpenter's bench; 4 planes; 3 hand saws; 10 chisels; 7 gauges; 2 screw-drivers; 2 bit stocks; 13 bits; 4 augers; 1 draw-knife; 1 spoke shave; 2 axes; 1 mallet; 1 steel square; 1 set fire-tools; 1 coal car; 1 pair platform scales; 2 wheelbarrows; 7 scoop shovels; 1 pick; 1 tube brush; 1 forge; 1 anvil; 5 pairs tongs; 2 hand chisels;

1 lawn-mower ; 1 steel rake ; 2 wooden rakes ; 2 scythes ; 3 forks ; 1 weeder ; 1 spade ; 1 cast-iron roller ; 6 ladders ; 3 step-ladders ; 200 feet 2-inch hose and pipe ; 100 feet ¾-inch hose and pipe ; 1 desk ; 2 tables ; 2 clocks ; 10 chairs ; 9 mats ; 6 spittoons ; 1 water-cooler ; 6 fire-pails ; 6 water-pails ; 4 bracket lamps ; 4 lanterns ; 6 hand-lamps ; 1 lot cocoa matting ; 1 watering-pot ; 1 feather duster ; 1 dust pan ; 2 dust brushes ; 1 window brush ; 1 floor brush ; 1 scrubbing brush ; 2 mops ; 2 brooms.

Tools, Furniture, etc., at Engine-house at Pond.

1 12-inch × 20-inch portable engine and boiler ; 1 12-inch centrifugal pump and belt ; 1 12-inch × 20-inch stationary engine ; 1 40 H. P. locomotive boiler ; 1 No. 2½ Blake pump ; 1 Hancock inspirator ; 2 12-inch Follansbee propeller pumps ; 1 lot shafting, pulleys, and belting ; 1 hand force-pump ; 30 feet 1-inch hose ; 10 feet ¾-inch steam hose ; 1 set fire tools ; 2 oil-cans ; 2 squirt cans ; 1 screw wrench ; 100 feet -inch fire hose and pipe ; 2 dip nets ; 1 belt awl ; 1 belt punch ; 1 lot belt lacings ; 2 bracket lamps ; 1 large lantern ; 2 chairs ; 1 cot bed and bedding.

EXPENDITURES OF WATER WORKS.

From the Auditor's Report.

Water Works (Construction).

Amount appropriated	$5,000 00
Add amount transferred to	730 50
	$5,730 50

EXPENDED.

For Cock	$7 00	
Freight	8 26	
Hydrants	198 95	
Iron pipes	2,240 89	
Lead	299 14	
Labor, as per pay-roll	1,088 42	
Meters	1,355 65	
Nozzles and valves	132 10	
Packing	14 17	
Swing valves	288 90	
Teaming	92 62	
Wharfage and labor	4 40	
As per item No. 48 of expenses		$5,730 50

Water Works (Maintenance).

Amount appropriated	$44,000 00
Add amount transferred to	1,371 60
	$45,371 61

EXPENDED.

For Advertising	$11 00
Analysis and attendance (E. S. Wood)	85 00
Bands	16 10
Bellows	1 00
Belting and oil	439 64
Car-fares and tickets	173 90
Carpenter-work	586 42
Carriage and horse hire	111 00
Castings and shafting	230 38
Cement	15 00
Clerical aid	1,000 00
Clerk of Board	200 00
Clock	1 00
Cocks	20 78
Conduit, examination of	6 75
Copper frames	20 00
Cracked stone	3 33
Dam, building	15 00
Dinners	117 25
Directory	2 50
Engineer, salary of, from June	750 00
Engineer, at Fresh Pond	149 88
Engine and boiler at Fresh Pond,	1,630 00
Expenses Mr. Raymond's funeral,	12 00
Expressage	95 17
Fitchburg R.R., use of train for repairs	62 50
Fittings and packing	384 18
Flooring stall	1 25
Foreman, salary of, from July	400 00
Freight and carting	1,092 12
Fresh Pond wharf and building contract	2,692 38
Fuel	5,104 63
Amount carried forward	$15,430 16

	Amount brought forward	$15,430	16
For	Galvanized wire	3	51
	Gas piping	8	26
	Gate boxes	42	64
	Grate bars	32	39
	Gauge repairs	1	50
	Hardware, tools, and repairs	463	50
	Harnesses, repairing	64	55
	Hay and grain	372	00
	Horse	200	00
	Horse, buggy, sleigh, etc.	363	00
	Horse, clipping	3	00
	Horse-shoeing	107	16
	Horse, use of	7	00
	Horse and wagon, use of	15	00
	Hose	52	50
	Hydrant boxes	85	19
	Hydrant cocks	3	38
	Inspectors	905	00
	Iron-work	33	24
	Inspirator at Fresh Pond	30	00
	Labor, as per pay-roll	17,040	23
	Lacing	1	45
	Lime	1	15
	Lumber and labor	301	12
	Machine labor	80	21
	Manure	29	40
	Mason at reservoir	138	20
	Meter repairs	149	08
	Newspapers	53	29
	Old iron	20	12
	Packing	105	30
	Painting	55	12
	Paving, labor	295	61
	Paving-stones	17	85
	Photographs	10	00
	Plumbing	34	21
	Amount carried forward	$36,555	32

Amount brought forward	$36,555 32	
For Polishing composition	3 00	
Postage-stamps	6 00	
Pulleys and shafting	120 41	
Pumping-engine, repairing	376 80	
Pumps	977 50	
Pumps, setting up at Fresh Pond,	344 60	
Pump, use of	2 00	
Putting up stove	1 80	
Printing	68 75	
Registrar, J. Warren Cotton, salary	2,000 00	
Rent of office and shop	600 00	
Rent of wharf	50 00	
Rubbers (machine)	2 55	
Salt hay for hydrants	21 12	
Sealing	1 27	
Spindles	5 00	
Stable, repairs of	2 75	
Stationery	163 87	
Stone	4 00	
Stones for dam	4 00	
Superintendent, H. Nevons, salary,	2,000 00	
Supplies	71 70	
Teaming	1,797 64	
Telegrams	91	
Telephone, repairing	5 00	
Valves, repairing	69 89	
Wagons, repairing	87 10	
Waste	13 13	
Watchman	15 50	
As per item No. 49 of expenses		$45,371 61

Water Works (Rates, Fines, etc.).

RECEIVED.

For rates, fines, etc., as per item No. 38 of receipts,	$181,158 73
Amount carried forward	$181,158 73

Amount brought forward		$181,158 73
Deduct amount transferred to interest on Water Loan . . .	$88,585 00	
Deduct amount transferred to Sinking-Fund, of Water Works .	44,355 00	
Deduct amount transferred to Water Works, Construction . . .	5,730 50	
Deduct amount transferred to Water Works, Maintenance . .	45,371 61	
		184,042 11
Over expenditure		$2,883 38

EXPENDED.

For water rates refunded, as per item No. 50 of expenses	1,123 38
Excess of expenditure	$4,006 76

Water Works (Supplies).

RECEIVED.

For Supply pipes and fittings, as per item No. 39 of receipts	$6,053 86

EXPENDED.

For Labor, as per pay-roll . .	$1,532 41	
Pipe fittings	2,496 33	
As per item No. 51 of expenses . . .		4,028 74
Balance unexpended		$2,025 12

REPORT

OF THE

TRUSTEES OF THE SINKING-FUND OF THE CAMBRIDGE WATER WORKS.

To the Honorable the City Council: —

The undersigned, Trustees of the Sinking-Fund of the Cambridge Water Works, herewith submit the annual report of the fund committed by ordinance to their charge: —

The amount of the fund December 1, 1882, was		$483,137 81
There has been received, during the year, interest on investments amounting to		25,005 11
There has been received, during the year, from the City of Cambridge, an amount equal to 3 per cent. on outstanding water bonds		44,355 00
		$552,497 92
CONTRA.		
Amount paid as accrued interest on securities purchased for investment during the year	$187 22	
Amount paid as premium on securities purchased	413 75	
Amount of water bonds matured August 1, 1883, — funds passed to the City Treasurer with which to pay the same	55,000 00	
		55,600 97
Leaving the amount of the fund, November 30, 1883, all securities taken at par		$496,896 95

The following is a list of the securities belonging to the fund: —

Cambridge Lowland Loan, six per cent. coupon bonds, maturing April 1, 1884	$3,000 00	
Cambridge Water Loan, six per cent. coupon bonds, maturing April 1, 1887,	6,000 00	
Cambridge Water Loan, six per cent. coupon bonds, maturing April 1, 1888,	25,000 00	
Cambridge Water Loan, six per cent. coupon bonds, maturing May 1, 1889,	8,000 00	
Cambridge Water Loan, six per cent, coupon bonds, maturing July 1, 1890,	31,000 00	
Cambridge Water Loan, six per cent. coupon bonds, maturing May 1, 1891,	26,000 00	
Cambridge Water Loan, six per cent. coupon bonds, maturing July 1, 1892,	1,000 00	
Cambridge Water Loan, six per cent. coupon bonds, maturing April 1, 1895	37,000 00	
Cambridge Water Loan, six per cent. coupon bonds, maturing July 1, 1896 .	46,000 00	
Cambridge Water Loan, six per cent. coupon bonds, maturing July 1, 1897,	16,000 00	
Cambridge Water Loan, five per cent. registered bonds, maturing July 1, 1898	12,500 00	
		$211,500 00
City of Boston five per cent. coupon bonds, maturing April 1, 1885 . .	8,000 00	
City of Boston five per cent. coupon bonds, maturing Jan. 1, 1886 . . .	1,000 00	
City of Burlington, Vt., six per cent. coupon bonds, maturing July 1, 1886 .	500 00	
City of New Bedford four per cent. coupon bonds, maturing Oct. 1, 1889 .	8,000 00	
City of Gloucester four and one half per cent. coupon bond, maturing July 1, 1890	5,000 00	
Town of Norwalk, Conn., four per cent. coupon bond, maturing at pleasure of town after Jan. 1, 1891 . . .	20,000 00	
Town of Hyde Park four per cent. bond, maturing July 1, 1891 . . .	5,000 00	
Amounts carried forward . . .	$47,500 00	$211,500 00

Amounts brought forward . . .	$47,500 00	$211,500 00
City of Salem four per cent. coupon bonds, maturing July 1, 1892 . . .	17,000 00	
Town of Stoughton four per cent. coupon bond, maturing Aug. 10, 1893 . .	2,000 00	
City of Keene, N.H., four per cent. coupon bonds, maturing July 1, 1894 . .	5,000 00	
Town of Hopkinton four per cent. coupon bonds, maturing Oct. 1, 1894 . .	5,000 00	
City of Fall River four per cent. coupon bonds, maturing May 11, 1895 . .	9,000 00	
City of Keene, N.H., four per cent. coupon bonds, maturing July 1, 1895 . .	3,000 00	
Town of Stoughton four per cent. coupon bond, maturing Aug. 10, 1895 . .	2,000 00	
City of Fall River five per cent. coupon bonds, maturing May 1, 1898 . .	2,000 00	
Town of Arlington five per cent. coupon bonds, maturing July 1, 1898 . .	30,000 00	
Town of Pawtucket, R.I., [five per cent. coupon bonds, maturing April 1, 1899,	25,000 00	
City of Providence four and one half per cent. coupon bonds, maturing June 1, 1899	3,000 00	
City of Boston four per cent. registered bond, maturing April 1, 1900 . .	4,000 00	
City of Fall River four per cent. coupon bonds, maturing Aug. 1, 1900 . .	13,000 00	
City of Providence five per cent. registered bonds, maturing July 1, 1906 . .	50,000 00	
United States four per cent. coupon bonds, maturing after July 1, 1907 . .	37,500 00	
Town of Winchester four per cent. coupon bonds, maturing May 1, 1908 . .	10,000 00	
Town of Beverly four per cent. coupon bonds, maturing July 1, 1911 . .	15,000 00	
Cash in First National Bank of Cambridge,	5,396 95	
		285,396 95
		$496,896 95

The bonded water debt, which the foregoing fund is expected to pay, matures as follows, viz.: —

July 2, 1886	$100,000 00
April 1, 1887	150,000 00
Amount carried forward	$250,000 00

Amount brought forward	$250,000 00
April 1, 1888	175,000 00
May 1, 1889	112,000 00
July 1, 1890	60,000 00
May 1, 1891	50,000 00
July 1, 1892	335,000 00
April 1, 1894	150,000 00
April 1, 1895	160,000 00
July 1, 1896	103,000 00
July 1, 1897	16,000 00
July 1, 1898	12,500 00
	$1,423,500 00

During the year $55,000 of our bonded Water Debt has matured, and the funds with which to pay the same have been paid into the City Treasury, to await the presentation of the bonds. It gives us much satisfaction to report that the City Council has at last acted favorably upon our request, made in a formal manner more than a year ago, relative to an adjustment of certain surplus receipts of the Water Works, which for a series of years had been diverted from this fund and paid into the City Treasury, for the purpose of meeting city expenditures. An order has been passed by both branches of the City Council and signed by the Mayor, which authorizes and directs the City Treasurer, in behalf of the City, to sign a note for $200,000 payable to "The Trustees of the Sinking-Fund of the Cambridge Water Works and their successors." Interest on this note, at the rate of four per cent. per annum, is to be paid annually by the City into this fund; but the principal of said note is not to be paid, either in part or whole, until all of the other assets of this fund are exhausted, unless the City at any time should desire to pay it. The result of this action of the City Council is, that a tardy act of justice has been performed, the law has been complied with, and the assets of this fund are to be $200,000 larger than the figures given in the foregoing report. All of which we feel is a subject for earnest congratulation.

JAMES A. FOX,
GEO. H. HOWARD,
WM. W. DALLINGER,
} *Trustees of the Sinking-Fund of Cambridge Water Works.*

CAMBRIDGE WATER BOARD, 1883.

CHESTER W. KINGSLEY . . . . . *President.*

Members of Board.

THE MAYOR,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

HENRY L. EUSTIS,	*term expires*	1888
CHESTER W. KINGSLEY,	" "	1887
JAMES M. W. HALL,	" "	1886
KNOWLTON S. CHAFFEE,	" "	1885
LEANDER M. HANNUM,	" "	1884

JUSTIN A. JACOBS, *Clerk.*

HIRAM NEVONS, *Superintendent of Works.*
J. WARREN COTTON, *Water Registrar.*

Trustees of Sinking-Fund of Water Loan.

THE MAYOR,
CITY TREASURER,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

City of Cambridge.

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THE

TWENTIETH ANNUAL REPORT

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL,

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS,

FOR THE YEAR 1884.

CAMBRIDGE:
JOHN WILSON AND SON.
University Press.
1885.

City of Cambridge.

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☆ CAMBRIDGE PUB. LBRY

REPORT

OF THE

CAMBRIDGE WATER BOARD.

To the Honorable City Council of the City of Cambridge: —

In accordance with the city ordinance, the Water Board herewith makes to you its twentieth annual report, being for the year ending Nov. 30, 1884: —

Total Cost of the Works.

Cost of the Water Works, Nov. 30, 1883, as per last year's report	$1,751,344.97
Expended on construction account during the year ending Nov. 30, 1884	31,519.74
Making the total expenditure	$1,782,864.71

Water Bond Account.

Whole amount of bonds issued	$1,750,900.00
Amount paid from Water Loan Sinking Fund	291,400.00
Leaving the unpaid Water Loan	$1,459,500.00
From this deduct the present value of the Water Loan Sinking Fund, per Trustees' account	787,161.56
Leaving the balance of Water Loan yet to be provided for by the Sinking Fund	$672,338.44

Statement showing in brief the transactions in connection with the Water Works for the year ending Nov. 30, 1884, including the unsettled balances of 1883: —

Memorandum.

In making up the accounts this year we have separated the "construction account" from the other accounts, in order that our books may agree with those of the City Auditor and Treasurer.

The following will show the corrected account of 1883, made up without including "construction account," and showing the amount actually due the Sinking Fund for 1883, and which this year is carried to that account, as will be seen further along: —

Received, 1883.

Net water-rates per last report	$179,361.89
Shutting off and letting on water, and fines	529.50
Rent of house	144.00
Supply account	6,053.86
	$186,089.25

Expended.

Maintenance account	$45,763.29	
Less bill unpaid	391.68	
		$45,371.61
Supply account		4,028.74
Interest on Water Loan	$88,585.00	
Add, paid by Treasurer	219.00	
		88,804.00
Sinking Fund, three per cent		44,355.00
Balance, showing surplus in 1883		3,529.90
		$186,089.25

We make the above memorandum and statement, that what might seem discrepancies between our account last year and this year may be explained.

Construction Account.

EXPENDED.

On general construction	$18,900.00	
On Stony Brook extension	12,619.74	
Expended in 1883, but not provided for by the issue of bonds	5,730.50	
		$37,250.24

RECEIVED.

From bonds issued Nov. 1, 1884	$36,000.00	
From premium on bonds	1,087.20	
From accrued interest for November	120.00	
Balance due city treasury	43.04	
		37,250.24

Water-Rates, Fines, and Supply Account.

RECEIVED.

From water-rates	$162,295.27		
Less rates refunded	769.00		
		$161,526.27	
Shutting off and letting on water, seals, and fines		372.00	
Rent of house		144.00	
From supply account		4,855.66	
Balance due Sinking Fund, 1883		3,529.90	
			$170,427.83

EXPENDED.

For maintenance account	$28,765.33	
For supply account	5,234.96	
For interest paid on Water Loan	84,451.00	
		$118,451.29
Paid Sinking Fund three per cent on $1,423,500 bonds outstanding	$42,705.00	
Surplus of 1884, to Sinking Fund	5,741.64	
Surplus of 1883, to Sinking Fund	3,529.90	
		51,976.54
		$170,427.83

Memorandum.

It will be seen by the above statement that with only ten months' receipts we show a surplus of $5,741.64 for this year. This is accounted for by the present City Council giving us credit this year for the water used during the year for watering the streets, amounting to $6,131.71, instead of passing the bill over to the next City Government to settle, as has been the custom for many years past. Thus we have the receipts from this source for both 1883 and 1884 in this year's account. If it had not been for this commendable change in the payment of the bill in the year where it really belonged, we should have shown a deficiency, instead of a surplus, this year.

In this connection we would repeat in substance what we anticipated last year, and which has now become a reality, that the estimated cost of bringing in our new water supply from Stony Brook, most of which will be expended during the coming year, will increase our annual fixed charges by the sum of $35,000; by which it will be seen that another year we shall need the entire receipts for twelve months to meet our expenses and interest, and to pay into the sinking fund what the law requires.

Comparative Receipts.

Water-rates for the year ending Nov. 30, 1883 . .	$179,361.89
Water-rates for the year ending Nov. 30, 1884 . .	161,526.27
Showing loss in 1884	$17,835.62

The explanation of the above apparent loss in 1884 is twofold, as follows: —

1st. The time for collecting the water-rates, for what seemed good reasons, was changed by the City Council from July 1 to May 1, and this gave us but ten months' water-rates to collect in 1884. We estimate this loss of two months' rates would amount to about $22,200.

2d. The reduction in the water-rates made this year we estimate cut down our receipts, as compared with the previous year, about $7,700.

If we take these two amounts, say	$29,900.00
And deduct the above deficiency of 1884	17,835.62
We should have, as a gain, on the same basis . .	$12,064.38
Deduct now the reduction in rates, which will remain a permanent loss	7,700.00
And we have about our real comparative showing, of 1883 and 1884, to be gain	$4,364.38

Instead of a loss of $17,835.62, as appears above.

Water Supplied.

Amount of water pumped in 1883 . . .	980,670,464 gallons.
Amount of water pumped in 1884 . . .	961,368,830 gallons.
Showing a decrease as compared with last year of	19,301,634 gallons.

This decrease in the consumption, although there have been more new supplies put in during the past year than for many former years, will, we think, be readily explained by looking at the Comparative Table of Rainfall herewith submitted. It will be seen that there was more than fifty per cent more rainfall in 1884 than in 1883 for the six months, from April 1 to October 1 each year, and this caused a large saving in the amount of water used through hand-hose.

If we divide the total amount of water pumped, 961,368,830 gallons, by 61,500, our present estimated population, we have a daily average per capita of 42.7 gallons; and this includes all water used for manufacturing purposes, watering streets, and for the extinguishment of fires, and continues us among the most economical cities in the use of water.

Sources of Water Supply.

MONTHS.	RAINFALL.			WATER IN THE POND BELOW HIGH-WATER MARK.		
	1882.	1883.	1884.	1882.	1883.	1884.
	Inches.	Inches.	Inches.	Feet.	Feet.	Feet.
December, 1883	3.30	1.87	2.94	5.48	6.45	11.10
January, 1884	4.73	2.94	4.81	5.48	7.10	10.67
February, „	4.48	2.85	6.67	4.27	6.73	8.89
March, „	2.49	1.76	4.91	1.82	5.52	5.90
April, „	2.27	2.48	4.22	1.24	5.09	2.99
May, „	4.98	4.10	3.18	1.64	5.68	3.01
June, „	2.73	2.28	3.79	2.06	6.32	3.68
July, „	2.08	2.38	4.56	3.04	7.47	4.33
August, „	1.41	.84	4.76	4.32	8.74	4.38
September, „	7.80	1.18	.70	5.09	9.87	5.68
October, „	2.19	5.61	2.90	5.82	10.38	6.67
November, „	1.21	1.96	2.63	5.90	10.75	7.34
Total for the year . .	39.62	29.75	46.07	Av. 3.77	Av. 7.50	Av. 6.26

The winter of 1883–84, fortunately for us, proved an unusually good one for getting a supply of water from the watershed represented by Wellington Brook. Several heavy falls of snow melted, and ran off in such a way that we were enabled to fill the Pond $8\frac{11}{100}$ feet, or within about 3 feet of high-water mark. The extremes being 11.10 feet below high-water mark in December, 1883, and 2.99 feet below high-water mark in April, 1884, showing a gain of $8\frac{11}{100}$ feet, as above. Notwithstanding the large amount of water caught and stored in the spring, and that the rainfall this year was more than fifty per cent over last year, yet the water on December 1 this year was only about six inches over the conduit leading to our pumps. These yearly experiences of reducing our Pond to so low a point, and this year under the most favorable circumstances, such as we cannot depend upon, confirm us in the conviction that we have not moved any too soon for a new and larger supply of water.

By reference to the rainfall tables herewith presented you will see that there were 46.07 inches of rainfall in 1884, as against 29.75 inches in 1883, showing a gain of 16.32 inches, or more than fifty per cent. This has had an important influence on the supply of water from unseen sources, or the ground flow of water that has found its way into the Pond.

Quality of the Water.

The good results of making the dams last year, which largely shut out of the Pond the low and marshy places on the southwesterly side, where large amounts of vegetation grew every year and decayed, falling into the Pond, have been seen in the excellent condition of our water during the year. It is seen in the analysis made for us; and we have never had less complaint about the water from our consumers, while, on the contrary, many have spoken in favorable and complimentary terms of the excellence of Fresh Pond water. There is now but one large place of pollution left which is still open directly into the Pond, — we refer to Black's Nook; in some respects this is the worst place of all; with this cut off by a dam we shall have a respectable and cleanly place to store our water. All reasonable efforts have been made by the Board to get the judicial injunction removed, so that we could proceed and put a dam across this nook; we shall continue our efforts, with the hope of ultimate success.

Additional Water Supply.

After urging the necessity of a further and larger water supply for several years, and having been obliged to record for three successive years our failure to get an Act of the Legislature for that purpose, we are now glad to state that last winter we secured the right to take water from Stony Brook, which is the boundary line between Waltham and Weston. In the month of July your honorable body made the necessary appropriation, at our request, to enable us to commence the work at once. We were obliged to make borings for the dam at Stony Brook, and a large amount of surveying work was necessary in order to get ready to lay out the work that was to be done. This is now completed, and the working plans are being made. We expect to commence the work on the dam within a short time, and to prosecute the same with all possible means at our disposal. A contract was awarded for making the necessary pipe and special castings, and some of the pipe is already delivered on the line where it is to be laid. We expect all of it will be delivered during the winter and spring, and we hope that by the end of another year the work will be well advanced towards completion.

As it is now settled that Fresh Pond must be our reservoir and storage basin for the next fifty years or more, it becomes a matter of great importance that all proper means should be used to furnish a clean and properly protected place to receive our new water supply. During this year we have done what we could to supplement the work, so well begun last year, of cleaning out the Pond. Taking advantage of the low state of the water in the Pond, we have removed a large amount of soft vegetable deposit from the bottom and around the borders, and in some shallow places we have dug the Pond deeper; we have also built up the banks of the Pond, and rip-rapped them with clean gravel and stone, so as to make it a clean and proper reservoir. All this has been done at a comparatively small expense, when we consider the benefit to be derived therefrom. Nature has done much to furnish Cambridge with a large storage basin, very convenient, and with attractive surroundings, combining the useful and beautiful in an unusual degree.

In 1875 the Legislature gave the city the right to take a strip of land five rods wide around the borders of the Pond (except where used for ice-cutting), for the purpose of preserving the purity of the water. In some places five rods wide might answer this purpose, but in other places, owing to the lay of the land, five rods is not enough. While it was not decided where the city would procure an additional and permanent supply of water, the Board did not feel like asking the City Council for the power to take this land, or purchase other needed land, to control the borders of the Pond and preserve the purity of the water. We are now unanimously of the opinion that the time has come when we should proceed under the Act referred to, and, by purchase, secure what land is needed for this purpose. We have therefore sent to you a communication setting forth briefly the facts in the case, and asking that the Water Board be authorized, by purchase or otherwise, to secure the necessary land around the Pond, to control the borders and preserve the purity of the water.

In connection with this it has been suggested that a road or drive-way might be made around the Pond, which, beside the additional value it would give to real estate in that neighborhood, would effectually shut off any building on its immediate borders, as the road could be so located as to make it, a large part of the way, the proper boundary of the land needed around the Pond. We are informed that the parties who own the land are nearly, if not quite, all willing to give the land, provided the city will lay out the road. We think this matter is worthy of your careful consideration and prompt action.

Extensions.

During the past year the high service has been extended to Dana Hill and to some of the high buildings of Harvard College. Wherever it has been introduced it gives great satisfaction, and even exceeds our expectations. A large pipe has also been carried up into the Belmont district. For the detailed accounts of all that has been done, and the present condition of things in connection with our Works, we would refer you to the reports made by the Registrar and the Superintendent to this Board, which latter contains the report of the Pumping Engineer to him; all of which we herewith submit to you as part of our report.

General Remarks.

As it became necessary for us to provide a place for a gate-house on the borders of the Pond where our water from Stony Brook will be discharged, and some way to get to it without trespassing on private property, also for the commencement of our pipe line from the Pond to Stony Brook, we have, under the power granted to the city by the Act of the Legislature of 1884, and by the City Council delegated to the Water Board, taken, by the right of eminent domain, a parcel of land on the easterly side of the Pond near Boat-House Nook, so called. Beginning at Fresh Pond Lane and running southwesterly, bounding on the Watertown branch railroad, forty feet wide, for a roadway; also a triangular piece, one side bordering on said railroad, and one side bordering on the Pond, for a gate-house; we have also taken a right of way along said railroad fifteen feet wide, running southeasterly and through private lands to Arsenal Street in Watertown, for a pipe line. The pipes are now being distributed along this line. As our work proceeds, other lands and rights of way will have to be procured by purchase or taken by right of eminent domain.

All the departments of the Water Works are in good condition, and the officers and regular employés are prompt and efficient in the performance of their duties. The Superintendent is about, early and late, looking after the details of the work, determined that no other water works shall exceed ours in good management and in reaching the most desirable results. Our new Registrar, who was familiar with the details of his office before his election, keeps everything in his department in good condition, and his many accounts well in hand. Our City Engineer has responded to our many calls with a promptness which shows his interest in our part of the city work, and his willingness to do all he can to assist us.

As it would be impossible for the City Engineer to give all the time we required, in addition to his other duties, we have employed Mr. N. Henry Crafts as consulting and assistant engineer during the building of the dam at Stony Brook, and while bringing the water to Fresh Pond. Mr. Crafts was the one who first suggested this source of supply for Cambridge. His long experience in this branch of engineering, and his familiarity with the whole matter, we think will make his services of great value to us. Our arrangement with him is such that we can command his entire time, if our interests require it. The making of the dam is a very important work, which must be well done and made safe, and we intend to have him inspect it as it progresses to the end.

We wish to express our gratitude to the City Council for its hearty and prompt response to our request for the means necessary to bring from Stony Brook our new water supply. At this time we believe it to be the most important of any one interest connected with the welfare of our city. In the future we have no doubt it will be a source of satisfaction and pleasant remembrance to all who had the opportunity, and lent a helping hand, to carry out this great and much-needed improvement. After we are all gone, the Water Works will remain a blessing to our successors, and a monument of sound and prudent action on your part in providing so great a boon for the present and future inhabitants of Cambridge.

In our last report it became our sad duty to refer to the death of our late President, the Hon. George P. Carter, whose loss we still mourn. This year it seems proper that we should refer to the death of our late Registrar, J. Warren Cotton. Mr. Cotton died July 30, last, after a long and painful illness. He was for many years in the employ of the city in offices of trust and responsibility, and always did his work well. We wish to put on record our high appreciation of his character as a man, and his faithfulness in the discharge of the duties of his office while he was Registrar; not only has the city lost a faithful servant, but the community has lost a good citizen, who led an upright and honorable life.

C. W. KINGSLEY,
K. S. CHAFFEE,
JOHN F. O'BRIEN,
JAMES M. W. HALL,
JAMES A. FOX,
GEO. H. HOWARD,
Water Board.

REPORT

OF

THE WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, Dec. 12, 1884.

To the Cambridge Water Board:—

IN compliance with the requirement of the City Ordinance, I present the twentieth annual report of the operations of this department, showing the receipts, expenditures, and abatements, together with a statement of the number of water-takers, fixtures, etc., for the year ending Nov. 30, 1884.

Amount of bills remaining unpaid Nov. 30, 1883:—		
Water-rates	$123.12	
Meter-rates	37.32	
Supplies and repairs	498.46	
	$658.90	
Amount of bills placed in hands of City Treasurer for collection, from Nov. 30, 1883, to Dec. 1, 1884:—		
Water-rates	$131,650.99	
Meter-rates	33,178.10	
Supplies and repairs	5,204.21	
Off and on water, rent, fines, and seals	516.00	
Total bills		$171,208.20
There have been collected:—		
Water-rates	$162,295.27	
Off and on, seals, and fines	372.00	
Amounts carried forward	$162,667.27	$171,208.20

Amounts brought forward		$162,667.27	$171,208.20
Rent of house and pipe-yard		144.00	
Supplies and repairs		4,855.66	
Total collections		$167,666.93	
There have been abated: —			
Water-rates	$2,599.71		
There remains unpaid: —			
Water-rates	94.55		
Supplies and repairs	847.01		
		3,541.27	
			$171,208.20

Expenditures.

Construction account (general)		$18,900.00	
Construction account (Stony Brook)		12,619.74	
Maintenance account, viz.: —			
Care and repairs	$15,801.05		
Pumping service	7,874.82		
New pumping service (salaries, coal, etc.)	1,563.14		
Office expenses	3,526.32		
		28,765.33	
Supply account		5,284.96	
Total			$65,520.03

Abatements.

Water-rate bills to the amount of	$2,599.71

Charges for water-rates, when the supplies are afterwards shut off, or fixtures sealed, are necessarily abated before the accounts can be balanced. New charges are then made when the water is again let on.

Refunds.

Water-rates have been refunded to the amount of	$769.00
Which amount, deducted from receipts	162,295.27
Leaves net receipts for water	$161,526.27
Add off and on, seals, fines, and rent	516.00
Makes net receipts of rates, fines, &c.	$162,042.27

Off and On.

Water has been shut off for non-payment of rates, or per order, on account of vacancy, and seals have been applied to fixtures by request of owners or occupants, as follows: —

Supplies shut off in 1883	303
" let on, shut off in 1883	218
" let on, shut off in previous years	61
New supplies let on	311
Seal-locks applied to fixtures in 1883	364
" removed, put on in 1883	146
" removed, put on in previous years	145

Statement of the yearly revenue received from water-rates, since the purchase of the Works by the city: —

From April 28, 1865, to Dec. 1, 1865	$32,367.19
„ Dec. 1, 1865, „ 1, 1866	40,073.27
„ „ 1, 1866, „ 1, 1867	52,733.62
„ „ 1, 1867, „ 1, 1868	63,747.42
„ „ 1, 1868, „ 1, 1869	76,149.30
„ „ 1, 1869, „ 1, 1870	92,606.95
„ „ 1, 1870, „ 1, 1871	111,782.65
„ „ 1, 1871, „ 1, 1872	127,201.30
„ „ 1, 1872, „ 1, 1873	146,117.32
„ „ 1, 1873, „ 1, 1874	153,634.27
„ „ 1, 1874, „ 1, 1875	138,880.37
„ „ 1, 1875, „ 1, 1876	179,166.76
„ „ 1, 1876, „ 1, 1877	154,843.59
„ „ 1, 1877, „ 1, 1878	157,443.91
„ „ 1, 1878, „ 1, 1879	164,681.90
„ „ 1, 1879, „ 1, 1880	173,325.49
„ „ 1, 1880, „ 1, 1881	170,062.73
„ „ 1, 1881, „ 1, 1882	177,430.80
„ „ 1, 1882, „ 1, 1883	179,361.89
„ „ 1, 1883, to May 1, 1884	161,526.27

Comparative Statement.

	1883.		1884.	
Construction Account.				
Received				
Expended	. . . .	$5,730.50	. . . .	$31,519.74
Supply Account.				
Received	. . . .	$6,058.86	. . . .	$4,855.66
Expended	. . . .	4,028.74	. . . .	5,234.96
Excess of receipts	. . . .	$2,025.12		
Excess of expenditures	. . . .	. . . .	. . . .	$379.30
Maintenance Account.				
RECEIVED.				
Rates, fines, etc.	. . . .	$180,035.89	. . . .	$162,042.27
EXPENDED.				
Care and repairs	$45,871.61	. . . .	$28.765.83	
Interest on Water Debt	88,804.00	. . . .	84,451.00	
Paid to Sinking-Fund Commissioners	44,855.00	178,530.61	42,705.00	155,921.83
Excess of receipts	. . . .	$1,504.78	. . . .	$6,120.94

1883. Maintenance Account, excess of receipts	$1,504.78
Supply Account, excess of receipts	2,025.12
Excess of total receipts over total expenditures	$3,529.90
1884. Maintenance Account, excess of receipts	$6,120.94
Supply Account, excess of expenditures	379.30
Excess of total receipts over total expenditures	$5,741.64

The excess of receipts for 1883 and 1884, as shown in the above comparative statement, amounting to $9,271.54, has been carried to the Sinking Fund, as required by law.

The falling-off in receipts for 1884, as compared with 1883, is caused by the change of date of payment of annual bills from July 1 to May 1, giving us but ten months' receipts for this year, and by the reduction of $22-rate houses to $18.

Beside the manufactories, etc., supplied by meter, water is now supplied to 12,015 families, 783 stables, with 2,190 horses and 266 cows, 218 shops, 362 stores and offices, by the following fixtures, viz.: —

14,582 faucets.
3,962 wash-basins.
2,445 wash-tubs.
2,195 bath-tubs.
5,577 pan-closets.
808 slop-closets.
20 hopper-closets.
81 urinals.
64 yard hydrants.
5 fountains.
3 tumbler-washers.
1,029 hand-hose.

Also,

601 fire-hydrants (beside 4 on private premises).
13 fire-reservoirs.
15 drinking-fountains in public squares.

The above is exclusive of the school-houses, engine-houses, police stations, and other city buildings, for which special rates are charged, except where meters are located.

All premises supplied with Fresh Pond water have been visited during the year, and from this inspection, aided by reports from plumbers, a considerable amount of water-rates has been added for fractional parts of the year.

Respectfully submitted,

WALTER H. HARDING,
Registrar.

REPORT

OF THE

COMMITTEE ON ACCOUNTS OF THE CAMBRIDGE WATER BOARD.

WE have examined the abstract of accounts, as presented us by the Water Registrar, covering the records of the past year. We have compared these with the statements submitted to us by the City Treasurer and Auditor, and we find them to agree. Annexed is the financial statement, in brief, presented to us by the Water Registrar, and verified by us: —

Amount of bills in hands of City Treasurer, Nov. 30, 1883: —

For water-rates	$123.12	
" meter-rates	37.32	
" supplies and repairs	498.46	
		$658.90

Amount of bills delivered to the City Treasurer for collection during the year ending Nov. 30, 1884: —

For water-rates	$131,650.99	
" meter-rates	33,178.10	
" supplies and repairs	5,204.21	
" off and on, seals, and fines	372.00	
" rent of house at pipe-yard	144.00	
		170,549.30
Amount carried forward		$171,208.20

Amount brought forward			$171,208.20
Of these amounts the Treasurer has collected	$167,666.93		
Less refunded	769.00		
		$166,897.93	
Refunded as above		769.00	
Abated		2,599.71	
Balance uncollected, 30, 1884		941.56	
			$171,208.20

JAS. M. W. HALL,
JAMES A. FOX,
GEO. H. HOWARD,
Committee on Accounts.

CAMBRIDGE, Dec. 1, 1884.

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DEC. 1, 1884.

Water-rates unpaid, Nov. 30, 1883 . . .		$160.44	
Bills placed in hands of City Treasurer for collection, from Dec. 1, 1883, to Dec. 1, 1884: —			
Water-rates from fractional ledger . . .		18,827.56	
" " annual ledger		12,333.47	
" " meter ledger		33,178.10	
" " building account . . .		489.96	
Off and on, rent, and fines		402.00	
Seals		114.00	
Total bills on rates, fines, etc. . .		$165,505.53	
Supply and repair bills unpaid Nov. 30, 1883	$498.46		
Supply and repair bills placed in hands of City Treasurer for collection, Nov. 30, 1883, to Nov. 30, 1884	5,204.21		
		5,702.67	
Total bills			$171,208.20
There has been collected, fractional ledger		$17,990.25	
" " annual ledger .		110,665.46	
" " meter ledger .		33,149.60	
" " building account		489.96	
" " off and on, rent and fines . .		402.00	
" " seals		114.00	
Total collections on rates, fines, etc. .		$162,811.27	
Collections on supply and repair accounts .		4,855.66	
Total collections		$167,666.93	
Amounts carried forward		$167,666.93	$171,208.20

Amounts brought forward		$167,666.93	$171,208.20
There have been abated, water-rates . . .		2,599.71	
There remain uncollected, water-rates	$94.55		
There remain uncollected, supplies and repairs	847.01		
		941.56	
			$171,208.20

Total collections	$167,666.93	
Less refunds	769.00	
Total net receipts		$166,897.93

Attest: W. H. HARDING,
Registrar.

REPORT

OF THE

SUPERINTENDENT OF THE WATER WORKS.

Cambridge, Dec. 1, 1884.

To the President and Members of the Cambridge Water Board: —

Gentlemen, — The annual report of your Superintendent, upon the condition of the Works and the operations of the past year, is herein presented.

The total amount of water pumped is 961,368,830 gallons. Coal consumed per million gallons pumped, 1,617 pounds. Water sold by meter, and that used for watering streets, 260,316,125 gallons, leaving as the amount for domestic use 701,052,705 gallons. Number of gallons daily for each inhabitant on whole amount pumped, 42.7 gallons. Number of gallons daily for each inhabitant on amount for domestic use, 31.14 gallons.

Spy and Little Ponds, Wellington Brook and Conduit.

Slight repairs have been made on the gate-house at Spy Pond. The houses and gates are now in good condition. No water has been drawn from either pond. The filter-basin appears to be in good condition; water was drawn from this source January 16, to April 10. The condition of Wellington Brook remains the same as at date of my last report. The gates were opened December 27, supplying Fresh Pond from this source from time to time as the condition of the water would warrant, until April 10, when the gates were closed. No inspection of the interior of the conduit has been deemed necessary; it appears to be in good repair.

Fresh Pond.

A large amount of work has been done on the borders of the Pond in clearing out and deepening shallow places, in forming banks, and rip-rapping the same. A street has been built, extending southerly from Fresh Pond Lane to the Pond at the north side of Boat-House Nook; and there is now a drive-way, with an average width of 20 feet, continuing from this point around the south and west shores as far as Black's Nook, where further improvements are obstructed for the present. It is a source of regret that this foul nook could not have been shut off from the Pond this season. When it is accomplished, the Pond will be in good condition for a reservoir.

The water in Fresh Pond reached its lowest point January 1, viz. 5.54, and its highest, April 27, viz. 14.08. The height at this date is 9.30.

The auxiliary pumps, raising water from the Pond to supply the pump-house conduit, continued in use till February 16, when they were no longer needed. They are all in good condition for further service.

Pumping Works.

No repairs have been needed on either the engine-house or coal-shed. An extension of eight feet in length has been added to the horse-shed for the accommodation of the engineer. A suitable fence is required around the engine-house lot and Tudor Park. They have received necessary care, grading the walks and cutting the grass.

Reservoir.

No repairs have been made, and nothing done except to keep the walks graded and grass cut. No indication of any recent movement of the walls is visible. As noted last year, the high wall should receive attention early in the spring, and a separate house should be built for the chronograph, as the records from it now are very imperfect, owing to the dampness at its present location.

High Service.

Extension has been made over Dana Hill, as recommended in my last report, and it became necessary to carry it to the Agassiz and Peabody Museums on Divinity Avenue. Manipulation of the stand-pipe valve three times daily was discontinued at the completion of the high-service system, giving a constant, even pressure on the low service. No complaint of a lack of supply has been received since it went into operation, indicating the complete success of the work. Although the extensions have doubled the number of high-service supplies, the increase of work required of the high-service engine is scarcely perceptible, and a large margin of power is left for future extensions.

There were laid for this service the following lengths of pipe: 1,880 feet of 8-inch from North Avenue and Garden Street through Harvard Square and Harvard Street to Quincy Street; 607 feet of 4-inch in Broadway, from Dana Street east; 914 feet of 4-inch in Linnæan Street, from Avon Hill Street to Lancaster Street (old high-service); 214 feet of 4-inch in Concord Avenue, west from Sparks Street (old high-service); 60 feet of 6-inch in Lambert Avenue, west from blow-off (old high-service); 710 feet of 6-inch and 117 feet of 4-inch in Kirkland Street, from junction of Cambridge Street to Frisbie Place (new high-service); and there were used eleven 4-inch check-valves, five 6-inch, one 10-inch, and one 12-inch check-valve, placed at various points on contour line 58, the grade separating the high and low services, and also two 4-inch gates, two 6-inch, one 10-inch, and one 12-inch gate, making a total of eighteen check-valves and seven gates.

Main Pipe.

Aside from the high-service extensions, main pipes have been laid in the following streets: 60 feet of 4-inch in Parker Street, 95 feet of 1½-inch in Valentine Court, 157 feet of 2-inch in Banks Street Court, 48 feet of 4-inch in Blanche Street, 97 feet of 1¼-inch in Hudson Court, 130 feet of 4-inch in Auburn Street, 2,061 feet of 2-inch in Lake View Avenue and Fresh Pond Drive, 100 feet of 1¼-inch and 82 feet of 1-inch in New Street, 167 feet of 4-inch in Granite Street, 280 feet of 4-inch in Cushing Street Court, 268 feet of 6-inch in Bridge Street, 165 feet of 1½-inch in Dickinson Street, 101 feet of 6-inch in Appleton Street, 294 feet of 6-inch in Garfield Street, 441 feet of 4-inch in Mercer Street, 3,062 feet of 8-inch in Mount Auburn and Cushing Streets, 95 feet of 6-inch in Mount Auburn Street, 36 feet of 6-inch in Crescent Avenue, 205 feet of 4-inch in Summer Street, 313 feet of 4-inch in Pilgrim Street, 468 feet of 10-inch in Mount Auburn Street (relaid, 6-inch taken up and 10-inch substituted), 317 feet of 4-inch in Clark Street, 547 feet of 6-inch in Henry Street, 29 feet of 6-inch in Western Avenue, 49 feet of 4-inch in Dodge Street, 201 feet of 1¼-inch in Dodge Street, 36 feet of 6-inch in Montgomery Street, 72 feet of 4-inch in Madison Street, 36 feet of 6-inch in Sixth Street, 204 feet of 4-inch in Vandine Street, 145 feet of 4-inch in Prentiss Court, 115 feet of 1-inch in Sibley Court, 700 feet of 8-inch in Albany Street, 33 feet of 6-inch in Albany Street, 216 feet of 4-inch in Kirkland Street, 266 feet of 4-inch in Rockingham Street, 167 feet of 4-inch in Otis Street, 254 feet of 4-inch in Kinnaird Street, and 173 feet of 4-inch in Howard Street. 138 feet of 3-inch was taken up, by request of the City Engineer, in Magazine Court, while a sewer was being built, and as it was unfit to relay, 4-inch pipe was substituted; also 39 feet of 3-inch in Walnut Court was taken up, and 4-inch put in its place.

New Supplies.

Three hundred and thirty-four new supplies have been laid during the year, making at this date a total of 8,338. Nine old supplies have been renewed and seventy furnished with sidewalk shut-offs.

Leakage.

Two hundred and forty-six leaks have been stopped: two on 8-inch main, one on 6-inch main, thirteen on 4-inch main, three on 3-inch main, one on 1½-inch pipe, one hundred and eighty-nine on premises, and thirty-seven on supplies in streets.

All the fixtures throughout the city have been inspected once during the year, and those in Ward 3 twice. No inspection of main pipes for leaks has been made since that noted in last report.

Brookline Street Pipe Bridge.

No repairs have been made on the pipe or bridge. October 4, on account of a serious break in the 48-inch water main of the Boston Water Works, the Brighton District being deprived of water, a request was received from the Boston Water Board, through their engineer, Mr. Brackett, for a supply from us to that district, while repairs were being made. The gates on Brookline Street Bridge were at once opened, and water was delivered from eleven o'clock A.M. to six o'clock P.M. The siphon has since been pumped out.

Hydrants.

Twelve new post hydrants have been set during the year and five flush hydrants removed; viz., at corner of Main and Brewery Streets, at corner of Gore and Carson Streets, at Brattle Square and Brattle Street, at corner of Amory and Summer Streets, and at stables Mount Auburn Street. The totals at date are 279 post hydrants and 322 flush hydrants, — 601 in all. There are also five flush hydrants on private premises: viz., two on premises of the Boston and Lowell Railroad Co., Prison Point Street; two on premises of the New England Glass Co., North Street; and one on premises of C. L. Jones & Co., Pearl Street. There are thirteen street reservoirs furnished with supplies.

Forty-one new hydrant-boxes and seventy-five new gate-boxes have been set in place of decayed ones removed.

Pipe Yard.

A strip of land 10,000 square feet in area has been added to the yard. The stable has been painted. The dwelling-house needs interior repairs, and will require shingling and painting the coming season.

Accompanying this report is that of the Engineer at the pumping station, and tables showing the monthly amount of water pumped; the Fresh Pond record of water heights; the locations of fountains, stand-pipes, and meters; the details of main and supply extensions; and the amount of stock on hand.

Respectfully submitted,

HIRAM NEVONS,
Superintendent.

List of Meters in Use Nov. 30, 1884.

METERS.	Locality.	Size.	Description.
		Inch.	
Alghieri, Simon	Main Street . . .	¾	Worthington.
Andrews, D. H.	Sixth Street . . .	1	Union.
American Rubber Co.	Potter Street . .	4	Crown.
American Rubber Co.	Potter Street . .	6	Gem.
American Net and Twine Co.	Third Street. . .	1½	Worthington.
American Steam Safe Works	Main Street . . .	1	Worthington.
American Steam Safe Works	Main Street . . .	1	Crown.
Bay State Brick Co.	Spruce Street . .	¾	Worthington.
Barnes, F. G. (Felton Hall)	Cambridge Street .	1½	"
Balcom, A. W..	Austin Street . .	¾	"
Baker, F. T.	Prospect Street. .	⅝	"
Berry, Casper	Elm Street . . .	1	Crown.
Bird, H. M..	Broadway. . . .	⅝	Union.
Bullock, O. S.	Broadway. . . .	1	Worthington.
Burton, A. & E.	Harvard Street . .	¾	"
Boston Woven Hose Co.	Broadway . . .	1½	"
Boston Stamping Co.	Third Street. . .	2	"
Boston & Lowell R.R. (Repair Shop) . .	Bridge Street . .	2	"
" " " (Round-house) . .	Prison Point Street	2	"
" " " (Paint Shop) . .	" " "	1	"
" " " (Round-house) . .	" " "	2	"
" " " (Car-house) . . .	" " "	2	"
" " " (Filling locomotives)	" " "	6	Union.
Carr Bros.	Lopez Street. . .	1	Worthington.
Capen, Sprague, & Co..	Sixth Street . . .	2	"
Cambridgeport Diary Co..	Magazine Street .	1	"
Cambridge Gas-Light Co.	Third Street. . .	1½	Crown.
Cambridge Gas-Light Co.	Ash Street . . .	¾	Worthington.
Campbell Bros.	Main Street . . .	¾	Worthington.
Charles River R. R. Co.	Hampshire Street .	¾	Union.
" " "	Brookline Street .	1	Worthington.
" " "	Green Street. . .	¾	Equitable.
" " "	Tremont Street. .	¾	Worthington.
City of Cambridge (Shepard School). .	North Avenue . .	2	"
" " (Ward 1 Building) .	Brattle Square . .	2	"
" " (Ward 4 Building) .	Central Square . .	1½	"
" " (Upton School) . .	Upton Street . .	2	"
" " (Cemetery). . . .	Coolidge Avenue .	4	"
" " (Almshouse) . . .	Tannery Street. .	2	"
Cambridge R. R. Co. (Washing cars) .	Dunster Street . .	¾	"
" " " (Repair Shop) . .	" " . .	¾	"
" " " (Car-house) . . .	" " . .	¾	"
" " " (Wooden Stable) .	" " . .	¾	"
" " " (Brick Stable) . .	" " . .	1½	"
" " " (Washing cars). .	Murray Street . .	1½	Crown.
" " " (Stable)	Murray Street . .	1½	Worthington.
" " " "	Camb. and Bald. Sts.	1	Desper.
" " " "	Baldwin Street . .	1	Worthington.
" " " (Brick Stable) . .	Cambridge Street .	1	"
" " " (Stable)	" "	1	"
" " " "	" "	1	"
" " " "	Mt. Auburn Street.	1	"
" " " "	North Avenue . .	2	"
" " " "	Main Street . . .	2	"
" " " "	River Street. . .	1	"
Cushman Bros.	Main Street . . .	¾	Desper.
Close, Geo.	Broadway . . .	1	Worthington.

List of Meters in Use Nov. 30, 1884.—Continued.

METERS.	Locality.	Size.	Description.
		Inch.	
Chapin, G. B.	Otis Street	¾	Crown.
Coleman, John, & Son	Broadway	1	Worthington.
Cooper's Car Wheel Co.	Hampshire Street	½	Desper.
Clark, B. P. & Co.	Main Street	1½	Worthington.
Cochrane, A. & Co.	Potter Street	1	Crown.
Cofran, S. M.	Concord Avenue	2	Worthington.
Coolidge, J. G. (Greenhouse)	Coolidge Avenue	1	"
Coolidge, J. G. (Barn)	Coolidge Avenue	2	"
Davis, Curtis, & Co.	Broadway	2	"
Davis, J. C. & Son	Broadway	1	"
Daniels, Badger, & Co.	First Street	¾	"
Davenport, A. H.	Cambridge Street	2	"
Dailey, C. W.	Cambridge Street	1	"
Derby, H.	Main Street	1	Crown.
Downing, Theo.	Eustis Court	1	Worthington.
Draper, Francis, & Co.	Otis Street	¾	Desper.
De Rosay, L. E. & Sons	Dublin Street	¾	Worthington.
Dow, Wm. H.	Portland Street	2	Crown.
Dee, T. W.	Brattle Street	1	Equitable.
East Cambridge Club Stable	First Street	1	Worthington.
Ela Bros.	Broadway	1	Worthington.
Elastic Paint Co.	Third Street	¾	Crown.
Episcopal Seminary	Brattle Street	1½	Worthington.
Farrell & Nagle	Frank Street	1	Worthington.
Fenton, N. & Co.	Gore Street	¾	Desper.
Geldowsky, F. & Co.	Otis Street	1	Worthington.
Gilmore & Eustis	Portland Street	2	"
Geopper Bros.	Ninth Street	1	"
Greeley, Leander	Broadway	1½	"
Griffin & Dolan	Decatur Street	¾	Desper.
Harvard College (Holworthy Hall)	College Grounds	¾	Worthington.
" " (Boylston Hall)	" "	2	Crown.
" " (Stoughton Hall)	" "	¾	Worthington.
" " (Sever Hall)	Quincy Street	¾	Crown.
" " (Thayer Hall)	Cambridge Street	1½	Worthington.
" " (In Yard)	College Grounds	1½	"
" " (Memorial Hall)	Cambridge Street	2	"
" " (Boat-house)	Flagg Street	¾	Desper.
" " (Botanic Garden)	Garden Street	1	Crown.
" " (Gymnasium)	Cambridge Street	1½	Crown.
" " (Holyoke House)	Harvard Street	2	Worthington.
" " (Museum)	Divinity Avenue	1	Worthington.
" " (Scientific School)	Kirkland Street	⅝	Desper.
" " (Law School)	Holmes Place	1½	Worthington.
" " (Laboratory)	Holmes Place	1	Worthington.
" " (Jarvis Field)	Everett Street	¾	Equitable.
Hilton, J. M.	Harvard Street	1½	Crown.
Hazlett, W. H. & Co.	Otis Street	1½	Worthington.
Hews, A. H. & Co.	Richdale Avenue	1	Worthington.
Hixon, Edw. & Co.	Main Street	1	Ball & Fitts.
Houghton, H. O. & Co.	Blackstone Street	2	Worthington.
Hovey & Co.	Cambridge Street	1	"
Howe & Putney	Distillhouse Street	1	"
Harvard Skating Rink	Putnam Avenue	¾	"
Ivers & Pond	Albany Street	¾	Ball & Fitts.
Johnson & Doane	Green Street	¾	Worthington.
Jasper, Geo. A. & Co.	Main Street	1	Worthington.

List of Meters in Use Nov. 30, 1884.—Continued.

METERS.	Locality.	Size.	Description.
		Inch.	
Jones, C. L. & Co.	Pearl Street	¾	Equitable.
Kemp, L. & Sons	Davis Street	1	Worthington.
Kennedy, F. A. & Co.	Green Street	1½	"
Kendall & Roberts	Main Street	¾	"
Low, J. W.	Reed Street	1½	"
Loan, J. J.	Columbia Street	¾	Union.
Little, Brown, & Co.	Blackstone Street	¾	Ball & Fitts.
Lamb & Ritchie	Albany Street	1½	Crown.
Mason & Hamlin	Broadway	2	Worthington.
Middlesex Bleachery and Dye Works	Sacramento Street	1	"
Middlesex County (Court-house)	Otis Street	¾	"
" " (Court-house)	Thorndike Street	¾	Union.
" " (House of Correction)	Thorndike Street	2	Worthington.
" " (Registry of Deeds)	Otis Street	¾	Worthington.
Millan, Alex.	Brattle Square	⅝	Desper.
Moore, Chas.	Farwell Place	1	Worthington.
Moring, Mrs. A. L. (Beck Hall)	Main Street	1	"
Mt. Auburn Corporation (Greenhouse)	Brattle Street	1	"
Mt. Auburn Corporation (Cemetery)	Mt. Auburn Street	¾	Desper.
Murdock, Wm. H.	Griggs Street	½	Desper.
New England Glass Works	North Street	2	Worthington.
New England Hoop Dressing Co.	Earl Street	1	Crown.
Norton, Edw. H.	Winsor Street	¾	Desper.
North, C. H.	Columbia Street	2	Worthington.
O'Brien, J. F.	Coolidge Avenue	¾	"
Page, Geo. G. Box Co.	Hampshire Street	2	"
Parry Bros. & Co.	Raymond Street	¾	"
Pike, Joel S. & Co.	Church Street	1	"
Pike, Joel S. & Co.	Palmer Street	¾	Ball & Fitts.
Porcellian Club	Harvard Street	¾	Crown.
Porter's Hotel	North Avenue	¾	Worthington.
Place, Charles	Davis Street	⅝	Desper.
Ross, Mrs. H. P.	Broadway	¾	Worthington.
Reardon, John, & Sons	Waverly Street	4	Worthington.
Reardon, Wm.	Portland Street	2	Crown.
Revere Sugar Refinery (North side)	Water Street	3	Union.
Revere Sugar Refinery (South side)	Water Street	3	Worthington.
Reversible Collar Co.	Mt. Auburn Street	1	"
Rideout, M. E. & Co.	State Street	1	"
Rideout, M. E. & Co.	Sands Street	1	"
Roberts, O. P.	Brattle Street	1	"
Rogers, Geo. M.	Washington Street	3	"
Russell & Zerega	State Street	¾	"
Rutherford & Dugan	First Street	1	Crown.
Sargent, Dr. D. A.	Palmer Street	1	Ball & Fitts.
Shorey, Geo. L.	Soden Street	2	Worthington.
Sands, M. W.	Walden Street	¾	"
Shaw & Applin	Bridge Street	1½	"
Smart, D. C.	Main Street	2	"
Sortwell & Co.	Distillhouse Street	2	"
Squire, J. P. & Co.	Gore Street	4	"
" "	" "	6	Gem.
" " (Stable)	" "	1	Worthington.
St. Mary's Church	Norfolk Street	2	"
Tower, Sylvester	Broadway	2	"
Tug "Henry Chapel"	First Street	2	Crown.
Thurston & Hall	Elm Street	¾	Worthington.

List of Meters in Use Nov. 30, 1884. — Concluded.

METERS.	Locality.	Size.	Description.
		Inch.	
Teele, Frank H.	Lincoln Court	⅝	Worthington.
Thayer, Henry, & Co.	Broadway	2	Worthington.
Tribune Publishing Co.	Linden Street	¾	Desper.
Tracy, M. F.	Boylston Street	1	"
Temple, F. L.	Kirkland Street	⅝	"
Uhrig, Joseph	Main Street	1½	Worthington.
Union Glass Co. (Pot room)	Webster Avenue	1	Worthington.
Union Glass Co. (Packing room)	Webster Avenue	⅝	Crown.
Varnum, Wm. H.	Putnam Avenue	⅝	Worthington.
Whitney, Horace W.	Main Street	⅝	Crown.
Wilson, John, & Son	Brattle Street	⅝	Worthington.
Woodbridge, S. F.	Frank Street	1	Worthington.
Wight & Scorgie	Mt. Auburn Street	¾	Desper.

List of Drinking-Fountains, Nov. 30, 1884.

Bridge Street, junction of Cambridge Street.
Broadway, southwest corner of Norfolk Street.
Brattle Square, east side of Brewer's Block.
Brattle Street, junction of Fresh Pond Lane.
Cambridge Street, south corner Fifth Street.
Central Square, west side.
Central Square, east side.
Hampshire Street, junction of Broadway.
Harvard Square, at the flag-staff.
Inman Square, east side.
Main Street, junction of Broadway.
Main Street, junction of Mt. Auburn Street.
North Avenue, southwest corner of Walden Street.
North Avenue, north side, west of Cameron Street.
Putnam Avenue, southwest corner of Pearl Street.

List of Stand-Pipes for Street Watering, Nov. 30, 1884.

Brattle Street, near University Press.
Brattle Street, corner Sparks Street.
Brattle Street, near Fayerweather Street.
Brattle Street, near Fresh Pond Lane.
Bridge Street, junction of Cambridge Street.

Broadway, near Third Street.
Broadway, corner of Sixth Street.
Broadway, corner of Winsor Street.
Broadway, junction of Hampshire Street.
Brookline Street, corner of Putnam Avenue.
Cambridge Street, near Warren Street.
Cambridge Street, near Winsor Street.
Cambridge Street, at Inman Square.
Columbia Street, near Austin Street.
Concord Avenue, at junction of Garden Street.
Dana Street, corner of Chatham Street.
Gore Street, west of Third Street.
Green Street, near Western Avenue.
Harvard Street, corner of Prescott Street.
Inman Street, near Broadway.
Kirkland Street, near Quincy Street.
Main Street, near Portland Street.
Main Street, near Hancock Street.
Magazine Street, opposite Warland Street.
Mt. Auburn Street, near Athens Street.
North Avenue, near Common.
North Avenue, corner of Sacramento Street.
North Avenue, near Roseland Street.
North Avenue, near Beech Street.
North Avenue, near Spruce Street.
North Avenue, corner of Norris Street.
North Avenue, opposite Tannery Street.
Prison Point Street, opposite Round House.
River Street, near Putnam Avenue.
Sixth Street, near Thorndike Street.
Third Street, near Rogers Street.
Thorndike Street, near Third Street.
Western Avenue, near Howard Street.

Main Pipe laid, Number of Gates and Fire Hydrants.

Locations.	Iron Pipe.		Gates.		Fire Hydrants.	
	Length.	Size.	No.	Size.	No.	Size.
	Feet.	Inch.		Inch.		Inch.
Harvard Square and Street (new high-service)	1880	8	2 1	8 6		
Broadway (new high-service)	607	4	1	4		
Linnæan Street (old high-service)	914	4	1	4		
Concord Avenue " "	214	4				
Lambert Avenue " "	60	6				
Kirkland Street (new high-service)	710	6	1	6		
Kirkland Street (new high-service)	117	4				
Parker Street	60	4				
Valentine Court	95	1½				
Banks Street Court	157	2				
Blanche Street	48	4				
Hudson Court	97	1¼				
Auburn Street	130	4				
Lake View Avenue and Fresh Pond Drive	2061	2				
New Street	100	1¼				
New Street	82	1				
Granite Street	167	4	1	4		
Cushing Street Court	280	4	1	4		
Bridge Street	268	6	1	6	1	5
Dickinson Street	165	1½				
Appleton Street	101	6				
Garfield Street	294	6	1	6	1	5
Mercer Street	441	4	1	4		
Mt. Auburn and Cushing Streets	8062	8	1 2	10 8		
Mt. Auburn and Cushing Streets	95	6	1	6	2	5
Crescent Avenue	86	6				
Summer Street	205	4	1	4		
Pilgrim Street	313	4				
Mt. Auburn Street (in place of 6-inch removed)	468	10				
Clark Street	317	4	1	4		
Henry Street	547	6	2	6	1	5
Western Avenue	29	6				
Dodge Street	49	4				
Dodge Street	201	1¼				
Montgomery Street	36	6				
Madison Street	72	4				
Sixth Street	86	6				
Vandine Street	204	4				
Prentiss Court	145	4				
Sibley Court	115	1				
Albany Street	700	8	1	8	2	5
Albany Street	83	6				
Kirkland Street	216	4				
Rockingham Street	266	4				
Otis Street	167	4	1	4		
Kinnaird Street	254	4				
Howard Street	173	4				
Brattle Street (flush removed)	...	..	1	10	1	5
Highland Street	...	..	1	12		
Amory Street, at Summer Street (flush removed)	...	..	..	..	1	5
Holworthy Street, near bridge	...	..	..	..	1	5
Franklin Street, between Brookline and Sidney	...	..	..	..	1	5
Pearl Street, at Glenwood	...	..	..	..	1	5
Magazine Court (3-inch removed)	138	4				
Walnut Court (3-inch removed)	89	4				

Recapitulation.

	12 in.	10 in.	8 in.	6 in.	4 in.	2 in.	1½ in.	1¼ in.	1 in.	Totals.
Length in feet of iron pipe .	. . .	468	5642	2245	5536	2218	260	398	197	16,964
Number of gates	1	2	5	7	8	. . .	. . .	. . .	. . .	23
Number of hydrants . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	12
Number of check-valves . .	1	1	. . .	5	11	. . .	. . .	. . .	. . .	18

New Supplies.

GALVANIZED PIPE AND BRASS FITTINGS USED FROM DEC. 1, 1883, TO NOV. 30, 1884.

	6 in.	1½ in.	1¼ in.	1 in.	¾ in.	Totals.
Length in feet of galvanized pipe . .	40	428	353	640	11,583	13,044
Number of new supplies	1	5	5	18	305	334
" stop and wastes	. . . .	5	5	16	315	341
" screw cocks	. . . .	5	5	19	279	308
" sidewalk cocks	. . . .	. . . .	. . . .	15	296	311
" sidewalk stand-pipes . . .	823	. . . .	. . . .	. . . .	. . . .	823
" boxes, frames, and covers .	11	. . . .	. . . .	. . . .	. . . .	11
" gates	1	. . . .	. . . .	. . . .	. . . .	1
" hose bibbs	. . . .	. . . .	. . . .	. . . .	½-in. 7	7

List of Check-Valves.

OLD HIGH-SERVICE.

	Size in inches.
Lake View Avenue, 150 feet north from Huron Street	10
Lake View Avenue, 150 feet north from Brattle Street	6
Fayerweather and Reservoir Streets	6
Sparks Street, opposite Dr. Wyman's stable	6
Concord Avenue, 135 feet south from Buckingham Street	6
Buckingham Street, 220 feet west from Concord Avenue	6
Garden and Linnæan Streets	6
Raymond and Linnæan Streets	6
Avon Hill and Linnæan Streets	6
Arlington Street, 230 feet west of North Avenue	6
Mt. Vernon Street, 100 feet west from North Avenue	6
Mt. Pleasant Street, 150 feet south from Walden Street	6

List of Check-Valves.—Continued.

New High-service.

	Size in inches.
Highland Street, on old 12-inch supply main	12
Dana Street and Broadway	4
Harvard Street, near Hancock	6
Centre Street, near Hancock	4
Dana Street, near Main	4
Harvard and Ellery Streets, two valves	6
Harvard and Trowbridge Streets, two valves	4
Harvard and Ware Streets	4
Harvard and Prescott Streets	4
Quincy Street, near Broadway	4
Broadway, on line of 6-inch pipe crossing College Grounds	6
Waterhouse Street, near small common	6
Kirkland and Cambridge Streets	10
Berkeley Street, near Craigie	4
Appian Way, near Brattle Street	4
Linnæan and Lancaster Streets (old high-service extension)	6
Kirkland Street and Frisbie Place	4

Statement of Stock on Hand Dec. 1, 1884.

For Street Mains (Iron Pipe and Fittings).

	48 in.	30 in.	24 in.	20 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Straight pipe (12 ft. each)	2	25	...	17	19	2	21	102	147	178	
Elbows	...	...	1	2	2	1	2	...	1	14	
Bends	...	1	2	...	...	1	9	5	16	16	
Y branches	...	...	1	...	...	1-24"					
Sleeves	...	1	5	8	2	8	2	2	7	12	8
Clamp Sleeves	...	...	6	5	1	4	7	8	6	6	4
Drain offsets	...	...	...	...	...	...	...	...	12		
Offsets	...	...	...	...	...	...	6	5	5	6	
Gates	...	...	...	...	...	1	1	...	3	4	
Check-valves	...	...	2	...	...	...	1	...	1		
Blow-off branches	...	...	...	2-6"							
Caps	...	...	...	...	...	8	4	...	10	2	
Clamps for cement pipe	...	...	...	...	...	...	2	10	1	6	
T's	...	...	1-24"	2-20"	8-6"	1-8"	1-10"	6-8"	12-6"	12-4"	1-8"
	...	...	1-20"	1-12"	...	4-6"	2-8"	6-6"	8-4"		
	...	...	1-16"	1-10"	...	2-4"	2-6"				
	...	...	1-8"	1-8"							
	...	...	8-6"	4-6"							
Crosses	...	...	...	1-20"	1-12"	7-10"	2-10"	8-6"	7-6"	22-4"	2-8"
	...	...	...	2-10"	8-6"	1-8"	8-8"	...	8-4"		
	...	...	...	...	...	8-6"	21-6"				
	...	...	...	...	...	8-4"					
Reducers	...	...	...	...	...	1-12"					
	...	...	1-10"	2-8"	1-6"	4-8"	8-8"	4-6"	4-6"		
	...	...	...	...	...	1-6"	...	...	11-4"		

FOR SUPPLIES (GALVANIZED PIPE AND BRASS FITTINGS).

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
Number of feet of galvanized pipe	170	580	1800	2350	500	20
Elbows	17	50	....	61	104	
Street elbows	....	....	....	25	12	
Couplings	81	80	80	56	200	
Unions	81	80	20	48	41	
Faucets	....	....	....	14	3	3
Stop and wastes	6	21	23	80	38	
Screw cocks	18	16	15	78	95	
Sidewalk cocks	....	....	....	32	39	
Screw cocks for cement pipe	....	4	....	27		
Blow-off cocks	....	6				
Hose bibbs	....	....	....	....	16	
Air chambers	....	....	....	41	50	38
Socket end of rod	....	....	....	....	46	
Nipples	52	20	70			
Plugs	3	16	16	24	45	
Bushings, 190 from 2 in. to ½ in.						
Fountain cocks	....	....	....	....	7	
Hydrant cocks	....	....	....	....	50	
Sill cocks	....	....	....	....	12	
Hose nipples	....	....	....	....	16	
Soldering nipples	....	....	....	....	2	
T's	2	23	23	7	100	
Cast-iron T's	25	100	90	100	400	
Crosses	70	110	90	80	30	
Caps	7	....	5	8	5	20
Reducing couplings, 43 from 2 in. to ½ in.						
Stand pipes, 13.						

Stock in Shop and at Yard.

3 hydrant valves.
9 bolts for flush hydrants.
50 stop and wastes for flush hydrants.
4 lead kettles.
2 furnaces.
3 bench vises.
3 drinking-fountains.
8 different size bands for capping main pipe.
10 hydrant boxes.
4 small gate boxes.
16 large gate boxes.
16 cock boxes.
2 check-valve boxes.
1 large frame and cover.
4 small frames and covers.
87 risers for large gate boxes.
90 risers for small gate boxes and cock boxes.
45 risers for hydrant boxes.
263 seals.
3 gross nuts.
3 axes.
4 sledge hammers.
1 gallon oil.
1 pair rubber boots.
¾ cord wood.
50 feet ¾-inch hose.
100 feet 2-inch hose.
1 cask cement.
3 screw-drivers.
1 square.
4 saws.
1 plane, compasses, etc., for carpentering.
A lot of counters and ratchet movements for meters.
3 4-inch spindles.
1 3-inch spindle.
9 6-inch spindles.
4 horses.
6 wagons.
4 harnesses.
1 sleigh.
1 pung.
1 double-runner sled.

7 blankets.
2 buffalo-robes.
3 oil-coverings for horses.
1 lathe, with the usual chucks and tools.
1 water meter.
1 threading machine, with dies complete.
1 drilling machine, with drills complete.
2 tapping machines for supplies, with taps and drills.
2 2-inch taps and drills.
2 hooks for tapping pipes.
1 breast drill.
1 ratchet for tapping pipe.
1 machine for tapping cement pipe, complete.
1 gig saw.
1 washer cutter.
1 platform scale.
2 grindstones.
1 large hand pump.
8 thawing pumps.
150 feet thawing-out pipe.
1 hay cutter.
1 large boom derrick.
3 small derricks.
1 breast derrick.
12 pipe wrenches.
2 nut wrenches.
5 monkey wrenches.
8 pipe cutters.
7 pair tongs.
2 sets main pipe tools.
12 gate wrenches.
3 blow-off wrenches.
10 shut-off wrenches.
3 2-inch cock wrenches.
2 1¼-inch wrenches.
3 hydrant wrenches.
10 oil cans.
8 die plates, with dies complete, from 2 inches to ⅛ inch.
2 keys to garden hydrants.
4 tool chests.
2 hand carts.
4 chains.
70 shovels.
46 picks.
13 French rammers.
2 paving rammers.
6 pails.
5 bars.
36 wheelbarrows.
4 tamping bars.
12 lanterns.
350 lbs. lead.
50 lbs. packing.
2 hydrant bodies.
6 flush hydrants in good repair.
25 flush hydrants out of repair.
2 flush hydrant frames.
29 flush hydrant covers.
7 garden hydrants.
4 post hydrants.
16 post hydrant rods.
1 hammer.
1 plough.
1 dray.
1 3-inch Worthington meter.
1 2-inch Worthington meter.
1 ¾-inch Equitable meter.
1 1½-inch Boston meter.
2 ¾-inch Desper meters.
4 ⅝-inch Desper meters.

REPORT

OF THE

ENGINEER OF THE PUMPING STATION.

PUMPING STATION, CAMBRIDGE WATER WORKS,
Dec. 1, 1884.

Hiram Nevons, Esq., Superintendent: —

SIR, — I would report the engines and boilers in their usual condition; nothing more than the ordinary repairs have been required during the past year. I would recommend that the tubes be cut out of boilers Nos. 1 and 2, the boilers thoroughly cleaned and examined, and the tubes pieced out and reset. The auxiliary pumping machinery at the Pond continued in operation until February 17, when, the Pond having risen to grade 8.28, it was stopped; it is in perfect condition, and ready to be started when required. The portable engine and boiler have been moved into the new building, and connected. We have now duplicate pumping machinery there of five million gallons capacity daily.

Following will be found a statement of the expenses at the pumping station, with the usual table.

E. C. BROOKS,
Engineer.

Expenses.

$372\frac{1870}{2240}$ tons Cumberland coal @ $5.29	$1,971.79
$321\frac{410}{2240}$ tons Cumberland coal @ $4.77	1,532.04
Oil, waste, packing, etc.	138.00
Tools	8.51
Repairs on engines and boilers	49.75
Repairs on buildings and care of grounds	449.73
Salaries	3,725.00
Total	$7,874.82

Engine Record, Pond Levels, and Rainfall.

Date.	Low-Service Engines.						High-Service Engine.						Total water pumped.	Daily average water pumped.	Total coal consumed.	Daily average coal consumed.	Av'age height of pond.	Rainfall.
	Total pumping time.		Daily average pumping time.		Total water pumped.	Daily average water pumped.	Total pumping time.		Daily average pumping time.		Total water pumped.	Daily average water pumped.						
	Hrs.	Min.	Hrs.	Min.	Gallons.	Gallons.	Hrs.	Min.	Hrs.	Min.	Gallons.	Gallons.	Gallons.	Gallons.	Lbs.	Lbs.	Feet.	Inches.
December, 1883......	330	00	10	39	71,145,900	2,295,029	330	00	10	39	2,292,491	73,952	73,438,391	2,368,981	130,000	4,194	5.75	2.94
January, 1884......	357	55	11	33	79,871,700	2,576,506	357	55	11	33	2,384,006	76,903	82,255,706	2,653,409	148,300	4,784	6.18	4.81
February, "	312	35	10	47	67,164,600	2,316,020	312	35	10	47	1,950,106	67,245	69,114,706	2,383,266	116,900	4,031	7.96	6.67
March, "	336	35	10	51	72,917,400	2,352,174	336	35	10	51	2,062,886	66,545	74,980,286	2,418,719	129,000	4,161	10.95	4.91
April, "	310	55	10	22	66,450,600	2,215,020	310	55	10	22	1,807,987	60,269	68,258,587	2,275,286	113,900	3,797	13.86	4.22
May, "	350	00	11	17	78,372,000	2,528,129	350	00	11	17	2,253,984	72,709	80,625,984	2,600,838	129,000	4,161	13.84	3.18
June, "	376	00	12	32	87,090,900	2,903,030	371	10	12	22	4,325,069	144,169	91,415,969	3,047,199	135,700	4,523	13.17	3.79
July, "	374	00	12	04	82,371,600	2,657,148	374	00	12	04	4,868,088	157,035	87,239,688	2,814,183	130,500	4,210	12.52	4.56
August, "	362	20	11	41	77,925,300	2,513,719	362	20	11	41	4,096,896	132,158	82,022,196	2,645,877	128,700	4,152	12.02	4.76
September, "	362	20	12	05	84,492,000	2,816,400	362	20	12	05	4,911,629	163,721	89,403,629	2,980,121	134,600	4,487	11.17	.70
October, "	355	00	11	27	81,399,300	2,625,784	355	00	11	27	4,600,992	148,419	86,000,292	2,774,203	133,600	4,310	10.18	2.90
November "	332	30	11	05	72,609,900	2,420,330	332	30	11	05	4,003,501	133,450	76,613,401	2,553,780	124,200	4,140	9.51	2.68
Total............	4,160	10	....	....	921,811,200	....	4,155	20	....	....	89,557,630	....	961,368,830	....	1,554,400	.....	.....	46.07
Daily average....	11	22	....	....	2,518,610	....	11	21	....	....	108,061	....	2,626,691	....	4,247	.....	10.59	......

Stock on Hand Dec. 1, 1884.

520 tons Cumberland coal; 15 gallons cylinder oil; 10 gallons engine oil; 36 gallons kerosene; 50 lbs. tallow; 50 lbs. cotton waste; 50 lbs. rubber packing; 5 lbs. asbestos packing; 1 bale flax packing; 1 cylinder head gasket; 24 9-inch rubber valves; 2 valve seats; 2 steam gauges; 10 lbs. Babbitt metal; ½ lb. solder; 5 lbs. sheet brass; ½ bale hair felt; 25 lbs. soap; 1 barrel fire clay; 1½ barrels cement; 15 feet 5-inch rubber belting; 5 files; 1½ lbs. emery; 5 gauge glasses; 7 lamp chimneys; 3 doz. lamp wicks; 3 lantern globes; 1 broom; 1 mop; 1 barrel brimstone; 300 lbs. bolts and nuts; 15 lbs. nails; 1 pair plungers and rings for No. 2 engine; 1 lot iron pipe, assorted sizes; 1 lot pipe fillings, assorted sizes; 10 feet 24-inch flange pipe; 8 feet 6-inch flange pipe.

Tools, Furniture, and Instruments.

1 18-inch × 10 feet engine lathe; 2 lathe chucks; 6 lathe dogs; 18 lathe tools; 1 grindstone; 1 3-inch × 9-inch engine, with shafting, belting, etc.; 2 vises; 1 vise bench; 1 die plate and dies; 1 set pipe dies; 1 set pipe taps; 1 set hand taps; 2 pipe cutters; 14 pairs pipe tongs; 2 hand hammers; 1 copper hammer; 18 cold chisels; 10 files; 1 hand bellows; 5 screw wrenches; 2 Stillson wrenches; 22 fork wrenches; 27 socket wrenches; 1 hydrant wrench; 6 gate wrenches; 2 clamp screws; 1 sledge; 2 ratchets; 24 drills; 1 breast drill; 2 jackscrews; 6 steel bars; 2 soldering irons; 4 cylinder-head cranes; 12 eyebolts; 75 starting bolts; 2 starting keys; 1 chain fall; 1 level; 1 gasket cutter; 2 ladles; 4 wooden horses; 1 oil cabinet; 1 set measures; 1 lot oil cans; 1 oil pump; 1 carpenter's bench; 4 planes; 3 hand saws; 10 chisels; 7 gouges; 2 screw-drivers; 2 bit stocks; 18 bits; 4 augers; 1 drawknife; 1 spokeshave; 2 axes; 1 mallet; 1 square; 1 set fire tools; 1 coal car; 1 pair platform scales; 2 wheelbarrows; 11 scoop shovels; 1 tube brush; 1 forge; 1 anvil; 5 pairs tongs; 2 hand chisels; 1 lawn mower; 1 steel rake; 3 wooden rakes; 2 scythes; 4 forks; 1 weeder; 1 spade; 1 pick; 1 cast-iron roller; 6 ladders; 3 step-ladders; 200 feet 2-inch hose and pipe; 100 feet ¾-inch hose and pipe; 1 water-cooler; 6 fire-pails; 6 water-pails; 1 watering-pot; 1 window brush; 1 floor brush; 1 feather

duster ; 1 dust-pan ; 2 dust brushes ; 1 scrubbing brush ; 2 mops ; 2 brooms ; 1 lot cocoa matting ; 9 mats ; 6 spittoons ; 1 lot gas fixtures ; 4 bracket lamps ; 4 lanterns ; 6 hand lamps ; 1 desk ; 2 tables ; 2 clocks ; 10 chairs ; 1 barometer ; 1 hygrophant ; 1 thermometer ; 2 rain gauges ; 1 snow gauge.

Tools, Furniture, etc., at Engine-House at Pond.

1 12-inch × 20-inch portable engine and boiler ; 1 12-inch centrifugal pump and belt ; 1 12-inch × 20-inch stationary engine ; 1 40-H. P. locomotive boiler ; 1 No. 2½ Blake pump ; 1 Hancock inspirator ; 2 12-inch Follansbee propeller pumps ; 1 lot shafting, pulleys and belting ; 1 hand force pump ; 30 feet 1-inch hose ; 10 feet ¾-inch steam hose ; 100 feet 1-inch fire hose and pipe ; 1 set fire tools ; 2 oil cans ; 2 squirt cans ; 1 screw wrench ; 2 dip nets ; 1 belt awl ; 1 belt punch ; 1 lot belt lacings ; 2 bracket lamps ; 1 large lantern ; 2 chairs ; 1 stove and pipe ; 1 cot bed and bedding.

EXPENDITURES OF WATER WORKS.

From the Auditor's Report.

Water Works (Construction).

Appropriation		$15,000.00
Additional appropriation		5,000.00
		$20,000.00
Deduct amount transferred from		1,100.00
		$18,900.00
RECEIVED.		
From premium on coupon bonds, as per item No. 40 of receipts	$1,207.20	
EXPENDED.		
For Advertising	$23.50	
American Bank-Note Co., altering plates	200.00	
Castings	314.53	
Check-valves	1,272.25	
Freight on water-pipe	729.50	
Galvanized pipe	271.80	
Hardware, tools, etc.	24.69	
Hydrants	408.70	
Labor, as per pay-rolls	4,769.04	
Lead	510.73	
Labor, extra	6.90	
Meters	553.50	
Packing	48.36	
Paving	81.00	
Repairing sewers	3.41	
Amounts carried forward	$9,217.91	$18,900.00

Amounts brought forward	$9,217.91	$18,900.00
For Stony Brook survey	43.21	
Teaming pipe, etc.	262.52	
Water-pipes	9,349.34	
Wharfage	27.02	
As per item No. 47 of expenses		$18,900.00

Water Works (Maintenance).

Appropriation	$30,000.00
Add amount transferred to	2,096.04
Additional appropriation	5,940.83
	$38,036.87

EXPENDED.

For Advertising	$1.75	
Analyses of water	50.00	
Belting	72.60	
Blankets and robe	34.00	
Bricks	30.90	
Boots, hip and rubber	11.20	
Carpenter-work	988.75	
Couplings, cocks, etc.	284.20	
Castings	151.24	
Cement	10.68	
Carpeting	3.25	
Carriage-hire	235.00	
Care of weir	10.00	
Clipping horse	3.00	
Cleaning vault	4.00	
Driving piles	100.04	
Desk	50.00	
Directory	7.50	
Dinners for committee at Waltham	174.00	
Dory	21.50	
Engine repairs	26.40	
Expressage	38.97	
Expenses to New York, Mr. Nevons	15.00	
Electric call-bell	35.00	
Amounts carried forward	$2,358.98	$38,036.87

Amounts brought forward	$2,358.98	$38,036.87
For Expense repairing drain (one half)	8.75	
Furniture and repairs	22.50	
Fuel	3,972.78	
Fares and car-tickets	137.00	
Fence	73.40	
Flowers	12.00	
Frost-cases	25.50	
Galvanized wire	4.80	
Grass-seed	1.00	
Hand-stamp	6.00	
Hardware, tools, and repairs	501.36	
Horse-shoeing	133.89	
Hydrant-boxes and repairs	62.74	
Hay and grain	503.38	
Horse medicine	1.95	
Harnesses and repairs	92.82	
Horse-shoeing	14.76	
Hose	99.53	
Horse	140.00	
Iron-work	20.41	
Labor, as per pay-rolls	9,807.35	
Lumber and labor at pumping station	194.04	
Lawn-dressing and seed	13.00	
Lawn-mower repairs	2.85	
Lumber	16.67	
Meter repairs	62.89	
Machine labor	66.81	
Mowing	10.00	
Mason-work	42.00	
Machinist	20.81	
Newspaper	11.00	
Oil	79.11	
Oil-can	1.10	
Pump, use of	156.00	
Plough	9.00	
Plumbing	56.41	
Painting and glazing	210.40	
Amounts carried forward	$18,952.99	$38,036.87

Amounts brought forward		$18,952.99	$38,036.87
For Paving		19.69	
Painting sleigh		10.00	
Plough repairs		6.00	
Piping and reflectors		163.80	
Printing		131.00	
Polishing-composition		2.00	
Plugs		3.15	
Repairing wall		8.00	
Rent of office		600.00	
Rent of wharf		50.00	
Rammers		1.50	
Salary of Superintendent		2,000.00	
Salary of Registrars, —			
Mr. Cotton	$1,333.33	1,833.33	
Mr. Harding	500.00		
Salary of Assistant Registrar		666.66	
" Foreman		1,030.00	
" Clerk of Board		200.00	
" Office Clerk		115.00	
" Engineer, Mr. Brooks		1,500.00	
Stuffing-box		3.00	
Smoke-pipe for engine at Fresh Pond		35.90	
Stove-pipe and stove		46.40	
Supplies		65.61	
Stationery and stamps		82.19	
Stand-pipes		471.25	
Slating		7.03	
Screenings		44.80	
Surplus of receipts for 1883 and 1884, paid to commissioners of Sinking Fund of Water Works		9,271.54	
Teaming		337.34	
Telegrams		3.82	
Telephone		25.00	
Telephone repairs		7.46	
Tags		.35	
Teaming gravel		44.50	
Amounts carried forward		$37,739.31	$38,036.87

Amounts brought forward	$37,739.31	$38,036.87
For Telegraph repairs	5.22	
Veterinary surgeon	26.00	
Valves	9.10	
Waste	31.00	
Wagon repairs	208.70	
Water-cock seals	16.68	
Wedges	.86	
As per item No. 48 of expenses		$38,036.87

Water Works (Rates, Fines, etc.).

RECEIVED.

For rates, fines, etc., for ten months, as per item No. 41 of receipts		$162,811.27
Deduct amount transferred to interest on Water Loan	$86,000.00	
Deduct amount transferred to Sinking Fund of Water Works	42,705.00	
Deduct amount transferred to Water Works, maintenance	30,000.00	
Deduct amount transferred to Water Works, maintenance and supply	1,231.00	
		159,936.00
		$2,875.27

EXPENDED.

For water-rates refunded, as per item No. 49 of expenses	769.00
Balance unexpended	$2,106.27

Water Works (Supplies).

RECEIVED.

For supply pipes and fittings (for ten months), as per item No. 42 of receipts	$4,855.66

EXPENDED.

For Labor, as per pay-rolls	$1,755.37	
Pipe fittings, etc.	3,479.59	
As per item No. 50 of expenses		5,234.96
Excess of expenditure		$379.30

Water Works (Construction, Stony Brook).

Additional water supply, appropriation		$300,000.00

EXPENDED.

For Boarding the engineers	$376.72	
Boat-hire	15.00	
Boring on site of dam	1,081.24	
Car-fares	87.51	
Carriage-hire	216.10	
Consulting engineer	1,000.00	
Draftsmen and surveyors	6,907.34	
Fuel	6.50	
Hardware and tools	.95	
Lumber	5.10	
Office contract	765.00	
Oars	1.60	
Printing	4.75	
Photographs	30.00	
Supplies	3.95	
Stove	31.07	
Stove-pipe	1.20	
Stone	154.25	
Teaming	1,869.46	
Use of instruments	62.00	
As per item No. 51 of expenses		12,619.74
Amount of appropriation unexpended		$287,380.26

REPORT

OF THE

TRUSTEES OF THE SINKING FUND OF THE CAMBRIDGE WATER WORKS.

To the Honorable the City Council: —

THE undersigned, Trustees of the Sinking Fund of the Cambridge Water Works, herewith submit their annual report of the fund committed by law to their charge: —

The amount of the fund, Nov. 30, 1883, was		$496,896.9
There has been received during the year interest on investments amounting to		33,377.49
There has been received during the year, as premium on securities sold		8,934.69
The City of Cambridge has given us its contingent note of		200,000.00
There has been received from the City of Cambridge, derived from water-rates, an amount equal to three per cent on amount of outstanding water bonds, viz.		42,705.00
There has been received from the City of Cambridge the surplus income of the Water Works during 1883 and 1884, viz.		9,271.54
		$791,185.67
CONTRA.		
Amount paid as accrued interest on securities purchased during the year	$626.66	
Amount paid as premium on securities purchased for investment	3,397.45	
		4,024.11
Leaving the amount of the fund, Nov. 30, 1884, all securities taken at par		$787,161.56

The following is a list of the securities belonging to the fund: —

Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1887	$6,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1888	25,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing May 1, 1889	8,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1890	31,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing May 1, 1891	26,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1892	1,000.00	
Cambridge Water Loan, four per cent coupon bonds, maturing Nov. 1, 1894	6,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1895	37,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1896.	46,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1897	16,000.00	
Cambridge Water Loan, five per cent registered bonds, maturing July 1, 1898 . . .	12,500.00	
Cambridge Contingent Loan, four per cent note, dated Dec. 1, 1883	200,000.00	
		$414,500.00
City of Boston, five per cent coupon bonds, maturing April 1, 1885.	$8,000.00	
City of Boston, five per cent coupon bonds, maturing Jan. 1, 1886	1,000.00	
City of Burlington, Vt., six per cent coupon bonds, maturing July 1, 1886	500.00	
City of New Bedford, four per cent coupon bonds, maturing Oct. 1, 1889	8,000.00	
City of Gloucester, four and one half per cent coupon bond, maturing July 1, 1890 .	5,000.00	
Town of Norwalk, Conn., four per cent coupon bond, maturing at pleasure of town after Jan. 1, 1891	20,000.00	
Amounts carried forward	$42,000.00	$414,500.00

Amounts brought forward	$42,000.00	$414,500.00
Town of Hyde Park four per cent bond, maturing July 1, 1891	5,000.00	
Town of Waltham, four per cent coupon bonds, maturing Sept. 1, 1891	46,000.00	
City of Salem, four per cent coupon bonds, maturing July 1, 1892	17,000.00	
Town of Stoughton, four per cent coupon bond, maturing Aug. 10, 1893	2,000.00	
City of Keene, N. H., four per cent coupon bonds, maturing July 1, 1894	5,000.00	
Town of Hopkinton, four per cent coupon bonds, maturing Oct. 1, 1894	5,000.00	
City of Fall River, four per cent coupon bonds, maturing May 1, 1895	9,000.00	
City of Keene, N. H., four per cent coupon bonds, maturing July 1, 1895	3,000.00	
Town of Stoughton, four per cent coupon bond, maturing Aug. 10, 1895	2,000.00	
City of Fall River, five per cent coupon bonds, maturing May 1, 1898	2,000.00	
Town of Arlington, five per cent coupon bonds, maturing July 1, 1898	30,000.00	
City of Boston, four per cent coupon bonds, maturing Jan. 1, 1899	50,000.00	
Town of Pawtucket, R. I., five per cent coupon bonds, maturing April 1, 1899 . . .	25,000.00	
City of Providence, four and one half per cent coupon bonds, maturing June 1, 1899 . .	21,000.00	
City of Boston four per cent registered bond, maturing April 1, 1900	4,000.00	
City of Fall River, four per cent coupon bonds, maturing Aug. 1, 1900	13,000.00	
City of Providence, five per cent registered bonds, maturing July 1, 1906	50,000.00	
Town of Winchester, four per cent coupon bonds, maturing May 1, 1908	10,000.00	
Town of Beverly, four per cent coupon bonds, maturing July 1, 1911	20,000.00	
Cash in First National Bank of Cambridge .	11,161.56	
		372,661.56
		$787,161.56

The bonded water debt, which the foregoing fund is expected to pay, matures as follows, viz.: —

July 2, 1886	$100,000.00
April 1, 1887	150,000.00
April 1, 1888	175,000.00
May 1, 1889	112,000.00
July 1, 1890	60,000.00
May 1, 1891	50,000.00
July 1, 1892	335,000.00
April 1, 1894	150,000.00
Nov. 1, 1894	36,000.00
April 1, 1895	160,000.00
July 1, 1896	103,000.00
July 1, 1897	16,000.00
July 1, 1898	12,500.00
	$1,459,500.00

Since our last report we have received from the City of Cambridge its note for $200,000, on which 4 per cent interest is to be paid annually to this fund. One year's interest, or $8,000, was paid during the past year, and is included in the foregoing report. One or two changes in our investments, together with the surplus shown in the management of the Water Works for the years 1883 and 1884, which we have received, very materially increase the capital of the fund, making it a strong guaranty for the payment of our bonded water debt, which in 1886 will begin yearly to mature with welcome regularity.

JAMES A. FOX,
GEO. H. HOWARD,
WM. W. DALLINGER,
} *Trustees of the Sinking Fund of the Cambridge Water Works.*

Commonwealth of Massachusetts.

In the Year One Thousand Eight Hundred and Eighty-four.

AN ACT

To provide a further Supply of Water for the City of Cambridge.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

SECTION 1. The city of Cambridge, for the purpose of supplying said city and the inhabitants thereof with pure water for the extinguishment of fires and for domestic and other purposes, may take, hold, and convey into and through said city, either by the way of Fresh Pond or otherwise, the waters of Stony Brook, in the towns of Waltham and Weston, and of the tributaries thereof, with any water rights connected therewith, and may also take and hold by purchase or otherwise any land, rights of way, easements, and real estate necessary for laying, constructing, and maintaining aqueducts, watercourses, reservoirs, storage basins, dams, and such other works as may be deemed necessary or proper for collecting, purifying, storing, retaining, discharging, conducting, and distributing said waters: *provided, however*, that there shall be reserved from said waters sufficient for the town of Weston to supply itself and its inhabitants with pure water for the extinguishment of fires and for domestic and other purposes; and *provided, further*, that there shall also be reserved from said waters sufficient for the town of Waltham to supply itself and its inhabitants with pure water for like purposes, whenever the legislature shall grant to said towns the right to take water from Stony Brook or its tributaries. But until the water thus to be reserved is actually diverted under any such legislative grant, Cambridge shall have the right to the same, and in any case to so much as is not thus diverted, in the same manner as though these respective reservations had not been made; and *provided*, that Cambridge shall not draw any water from said reservoir or storage basin for its own use, or for the use of any other town or city, except when the water is running to waste over the dam, without the consent of Waltham and Weston, and said dam shall be built and maintained by the city of Cambridge at an elevation of twenty feet above the top of the present dam on Stony Brook at Roberts' Mills, and the construction of said dam shall be commenced within one year and completed within three years from the passage of this act.

SECT. 2. Said city shall, within sixty days after taking any lands, rights of way, water rights, water sources, or easements aforesaid, otherwise than by purchase, for the purposes of this act, file and cause to be recorded in the registry of deeds for the county and district in which such land or other property is situated, a description thereof sufficiently accurate for identification, with a statement of the purpose for which the same was taken, which statement shall be signed by the mayor.

SECT. 3. Said city, for the purposes aforesaid, may construct aqueducts and maintain the same; may construct and maintain dams, reservoirs, storage basins, and other proper works; may erect buildings and machinery; may make and establish such public fountains and hydrants as may from time to time be deemed proper, and may change or discontinue the same; may regulate the use of water, and establish the price or rates to be paid therefor, and collect the same by process of law. Said city may also, for the purposes aforesaid, carry any pipe, drain, or aqueduct over or under any river, watercourse, street, railroad, public way, highway or other way, in such manner as not unnecessarily to obstruct the same, and may enter upon and dig up such road, street, or way for the purpose of laying down, maintaining, or repairing any pipe, drain, or aqueduct, and may do any other things necessary and proper in executing the purposes of this act.

SECT. 4. If said city enters upon and digs up, for the purposes aforesaid, or, by reason of anything authorized by this act, injures any road, street, or way which is outside the limits of said city, it shall be subject to such reasonable regulations as may be prescribed by the selectmen of the town, or the mayor and aldermen of the city, in which such road, street, or way is located, and shall restore the same to as good order and condition as it was in when such digging commenced, or before such injury occurred; and the work shall be done and all repairs be made in such manner and with such care as not to render any road, street, or way, in which such pipes are laid, unsafe or unnecessarily inconvenient to the public travel thereon. Said city shall at all times indemnify and save harmless any such city or town which is liable to keep in repair any road, street, or way aforesaid, against all damages and costs which may be recovered against it, and shall reimburse to it all expense which it shall reasonably incur in the defence of suits or otherwise by reason of any defect or want of repair in such road, street, or way, caused by the placing, maintenance, repairing, or replacing of said pipes, or by reason of any injury to persons or property, caused by any defect or want of repair in any such pipes: *provided*, that said city has notice of any claim or suit for such damage or injury, and an opportunity to assume the defence thereof.

SECT. 5. Said city shall be liable to pay all damages sustained by any persons or corporations by the taking of, or injury to, any of their land, water, water rights, rights of way, easements, or property, or by the constructing or repairing of any aqueduct, reservoir, or other works, for the purposes aforesaid. If any person sustaining damage, as aforesaid, does not agree with said city upon the amount of said damage, he may, within three years from such taking, and not afterwards, apply by petition for an assessment of the damage to the superior court in the county in which the property taken or damaged is situated. Such petition may be filed in the clerk's office of said court, in vacation or in term time, and the clerk shall thereupon issue a summons to the said city, returnable, if issued in vacation, at the next term of the court to be held after the expiration of fourteen days from the filing of the petition; and if in term time, returnable on such day as the court shall order, to appear and answer to the petition. The summons shall be served fourteen days at least before the term or day at which it is returnable, by leaving a copy thereof and of the petition, certified by the officer who serves the same, with the clerk of said city; and the court may, upon default or hearing of said city, appoint three disinterested persons who shall, after reasonable notice to the parties, assess the damages, if any, which such petitioner may have sustained as aforesaid; and the award of the persons so appointed, or a major part of them, being returned into and accepted by the court, shall be final, and judgment shall be rendered and execution issued thereon for the prevailing party with costs, unless one of the parties claims a trial by jury as hereinafter provided.

SECT. 6. If either of the parties mentioned in the preceding section is dissatisfied with the amount of damage awarded, as therein expressed, such party may, at the term at which such award was accepted or the next term thereafter, claim, in writing, a trial in said court, and have a jury to hear and determine at the bar of said court all questions of fact relating to such damages, and to assess the amount thereof; and the verdict of the jury being accepted and recorded by the court, shall be final and conclusive, and judgment shall be rendered and execution issued thereon, and costs shall be recovered by the parties, respectively, in the same manner as is provided by law in regard to proceedings relating to the laying out of highways.

SECT. 7. No application shall be made to the court for the assessment of damages for the taking of any water rights, or for any injury thereto, until the water is actually withdrawn or diverted by said city under the authority of this act.

SECT. 8. In every case of a petition to the superior court for an assessment of damages, as provided in this act, the city may tender to the complainant or his attorney any sum, or may bring the same into court to be paid to the complainant for the damages by him sustained or claimed in his petition, or may in writing offer to be defaulted, and that damages may be awarded against it for the sum therein expressed, and if the complainant does not accept the sum with his costs up to that time, but proceeds in his suit, he shall be entitled to his costs up to the time of the tender of such payment into court, or offer of award, and not afterwards, unless the complainant recovers greater damages than were so offered.

SECT. 9. In estimating the damages for anything taken under this act, the city of Cambridge shall be held to pay as if there were no reservation in the first section hereof in favor of Weston and Waltham, and if the town of Waltham shall ever take any part of the water reserved for it in the first section hereof, it shall pay to Cambridge a fair proportion of the damages paid by Cambridge for water and water rights taken, and if Waltham takes from any reservoir or pipes constructed by Cambridge, under the authority of this act, or any act in amendment hereof, it shall pay to Cambridge a fair proportion of the cost to Cambridge (excluding interest) of the works connected with said reservoir or pipes. If Cambridge and Waltham cannot agree as to the sums to be paid, either party may apply to the superior court, in the county of Middlesex, and the court, upon such notice to the other party as it may order, shall appoint three commissioners, who shall, after reasonable notice, fix the amount to be paid, and the award of them or a major part of them being returned into and accepted by the court, shall be final, and judgment shall be rendered and execution issued thereon, and the court may award costs to either party as may seem to the court just and equitable, and execution shall issue therefor.

SECT. 10. All the rights, powers, and authority given to the city of Cambridge by this act shall be exercised by said city, subject to all duties, liabilities, and restrictions herein contained, in such manner and by such agents, officers, and servants as the city council shall from time to time ordain, direct, and appoint.

SECT. 11. For the purpose of defraying the cost of such franchises, property, lands, easements, water, and water rights as may be purchased, taken, or held for the purposes aforesaid, and of constructing the works authorized by this act, and paying all expenses incident thereto, the city council of Cambridge shall have authority to issue in addition to what it is already authorized by law to issue, scrip or bonds, to be denominated on the face thereof "Cambridge Water Loan," to an amount not exceeding five hundred thousand dollars, bearing interest not exceeding six per centum per annum, payable semi-annually, the principal to be payable at periods of not more than thirty years from the issuing of such scrip or bonds respectively. Said city council may sell the same, or any part thereof, from time to time, or pledge the same for money borrowed for the above purposes; but the same shall not be sold or pledged for less than the par value thereof. The provisions of section eight of chapter one hundred and fifty-three of the acts of the year eighteen hundred and sixty-five, and of section two of chapter one hundred and forty-five of the acts of the year eighteen hundred and seventy-five, in regard to establishing and maintaining a sinking fund for the redemption of the "Cambridge Water Loan," shall apply to this act; and said sinking fund shall remain sacred and inviolate, and pledged to the payment and redemption of said debt, and shall be used for no other purpose. The provisions of the tenth and eleventh sections of chapter twenty-nine of the Public Statutes shall, so far as applicable, apply to said sinking fund.

SECT. 12. The occupant of any tenement shall be liable for the payment of the rent for the use of the water in such tenement, and the owner thereof shall be also liable if, on being notified of such use, he does not object to the same.

SECT. 13. All acts and measures necessary to preserve and maintain the purity and to prevent the pollution of the waters of said Stony Brook shall be performed, and the expense and damages thereof paid, by the city of Cambridge.

SECT. 14. Whoever wantonly or maliciously diverts the water, or any part thereof, taken or held by said city pursuant to the provisions of this act, or corrupts the same, or renders it impure, or destroys or injures any dam, aqueduct, pipe, conduit, hydrant, machinery, or other works or property, held, owned, or used by said city under the authority and for the purposes of this act, shall forfeit and pay to said city three times the amount of the damages assessed therefor, to be recovered in an action of tort; and on conviction of either of the wanton or malicious acts aforesaid may also be punished by fine not exceeding three hundred dollars, or by imprisonment not exceeding one year in the house of correction in said county of Middlesex.

SECT. 15. Nothing contained in this act shall be so construed as to prevent the inhabitants of the towns of Weston and Waltham from taking from said brook, or its tributaries, so much of the water as shall be necessary for extinguishing fires, and for all domestic and other purposes.

SECT. 16. The city of Cambridge is hereby authorized, if said city shall deem it expedient so to do, to supply the towns of Belmont and Watertown, or either of them, with water in such quantities, under such conditions, and upon such terms as may be agreed upon between said city of Cambridge and said towns, or either of them.

SECT. 17. This act shall take effect upon its passage; but shall become void unless it is accepted by the city council of Cambridge within three months from its passage, and unless work is commenced under it within one year from its passage.

Approved, May 21, 1884.

[The foregoing act is chapter 256 of the Acts of 1884.]

CAMBRIDGE WATER BOARD, 1884.

CHESTER W. KINGSLEY . . . . *President.*

Members of Board.

THE MAYOR,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

JOHN F. O'BRIEN,	*term expires*	1889
LEANDER M. HANNUM,	" "	1888
CHESTER W. KINGSLEY,	" "	1887
JAMES M. W. HALL,	" "	1886
KNOWLTON S. CHAFFEE,	" "	1885

JUSTIN A. JACOBS, *Clerk.*

HIRAM NEVONS, *Superintendent of Works.*
WALTER H. HARDING, *Water Registrar.*

Trustees of Sinking Fund of Water Loan.

THE MAYOR,
CITY TREASURER,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

City of Cambridge.

32030

THE

TWENTY-FIRST ANNUAL REPORT

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL,

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS,

FOR THE YEAR 1885.

CAMBRIDGE:
H. E. LOMBARD, BOOK AND JOB PRINTER,
636 MAIN STREET.
1886.

City of Cambridge.

THE

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☆ CAMBRIDGE PUB. LBRY

REPORT

OF THE

CAMBRIDGE WATER BOARD.

To the Honorable City Council of the City of Cambridge:—

As required by the city ordinance, the Water Board herewith submits its twenty-first annual report, being for the year ending Nov. 30th, 1885.

Total Cost of the Works.

Cost of the Water Works, Nov. 30, 1884, as per last year's report	$1,782,864.71
Expended on construction account during the year ending Nov. 30, 1885	304,513.78
Making the total expenditure	$2,087,378.49

Water Bond Account.

Whole amount of Bonds issued	$2,038,900.00
Amount paid from Water Loan Sinking Fund .	291,400.00
Leaving unpaid Water Loan	$1,747,500.00
From this deduct the present value of the Water Loan Sinking Fund, as per Trustees' account .	874,373.38
Leaving the balance of Water Loan yet to be provided for by the Sinking Fund	$873,126.62

Statement showing in brief the transactions in connection with the Water Works for the year ending Nov. 30, 1885.

General Construction Account.

RECEIVED.

From excess of receipts for rates, fines, etc. . .	$12,434.32

EXPENDED.

Balance due City Treasury, Nov. 30, 1884 . .	$43.04
On general construction account	12,391.28
	$12,434.32

Stony Brook Construction Account.

RECEIVED.

From Bonds issued, par value	$288,000.00
From premium on Bonds sold	19,550.40
State of Massachusetts, for survey	15.73
	$307,566.13

EXPENDED.

On Stony Brook construction	$292,122.50
Balance of appropriation unexpended	15,443.63
	$307,566.13

Water-Rates, Fines, and Supply Account.

RECEIVED.

From water-rates	$186,805.14	
Less rates refunded	1,260.78	
		$185,544.36
Shutting off and letting on water, seals, and fines		447.50
From supply account		6,250.55
		$192,242.41

EXPENDED.

For general construction account	$12,434.32
For maintenance account	29,914.51
For supply account	4,491.97
For interest on Water Loan	92,725.00
Paid into Sinking Fund, three per cent on bonds outstanding, $1,747,500	52,425.00
Surplus of 1885 to Sinking Fund	251.61
	$192,242.41

Comparative Receipts.

Water-rates for ten months to Nov. 30, 1884 . .	$161,526.27
Water-rates for the year ending Nov. 30, 1885 . .	185,544.36
Showing excess of water-rates in 1885	$24,018.09

Memorandum.

The large excess of rates in 1885 over 1884, as shown above, is largely explained by the change in the year, now ending May 1st, instead of July 1st, as formerly, by which in 1884 we got water-rates for only ten months.

Water Supplied.

Amount of water pumped in 1885 . .	1,125,252,287 gallons.
Amount pumped in 1884	961,368,830 gallons.
Showing an increase in 1885 of . . .	163,883,457 gallons.

This is the largest amount of water ever pumped in one year, and shows a daily average increase during the year of 448,968 gallons. A further examination of where and how this water was used, shows the following results: —

Amount sold by meter, and used for watering the streets	278,959,925 gallons.
Amount used for domestic and other purposes	846,292,362 gallons.
Total	1,125,252,287 gallons.
Daily average pumping during the year .	3,082,884 gallons.

This was divided as follows: —

Average daily high service	213,191 gallons.
Average daily low service	2,869,693 gallons.
	3,082,884 gallons.

The high service is furnished through the stand-pipe, while the low service is supplied from the reservoir level.

The daily average for each inhabitant for the whole amount pumped was . . . . . . $49\frac{72}{100}$ gallons.
The daily average for each for domestic and other purposes was . . . . $37\frac{4}{10}$ gallons.

This shows an increase in the average amount per inhabitant used daily, over former years, while the very large increase in the amount of water pumped this year over any former year shows conclusively that we much need the additional supply which we are now working for, and hope before long to secure.

Rainfall and Height of Water in the Pond.

MONTHS.	RAINFALL.			WATER IN THE POND BELOW HIGH-WATER MARK.		
	1883.	1884.	1885.	1883.	1884.	1885.
	Inches.	Inches.	Inches.	Feet.	Feet.	Feet.
December, 1884	1.87	2.94	4.60	6.45	11.10	7.68
January, 1885	2.94	4.81	5.43	7.10	10.67	7.71
February, "	2.85	6.67	2.94	6.73	8.89	7.61
March, "	1.76	4.91	1.06	5.52	5.90	6.72
April, "	2.48	4.22	3.61	5.09	2.99	6.42
May, "	4.10	3.18	3.77	5.63	3.01	6.35
June, "	2.28	3.79	4.10	6.32	3.68	6.94
July, "	2.38	4.56	1.72	7.47	4.33	7.91
August, "	.84	4.76	5.21	8.74	4.83	9.07
September, "	1.18	.70	1.78	9.87	5.68	9.95
October, "	5.61	2.90	5.56	10.38	6.67	10.69
November, "	1.96	2.63	9.20	10.75	7.34	10.69
Total for the year	29.75	46.06	48.98	Av. 7.50	Av. 6.26	Av. 8.15

An examination of the above table, in connection with the amount of water pumped, as shown by the Engineer's report, will show what a close connection there is between the amount of rainfall and the capacity of the Pond to furnish water from unseen sources, or in other words from the unseen ground flow of water into the Pond, and we think this is another link in the evidence to demonstrate that the sources of supply to the Pond from unseen resources, are not from some far-off inexhaustible fountain head, but are dependent on the rainfall of its own immediate water-shed.

In making these comparisons we will take the last six months of 1883, 1884, and 1885, that being a time when the influences of the spring rains and melting snows have passed away, and the Pond is in its annual condition of a falling surface every day, showing that our demand exceeds the supply. In our calculations we have assumed the capacity of the Pond to be 4,000,000 gallons per inch, and while this is not the exact amount, and in the nature of things the exact amount cannot be ascertained with the Pond constantly settling, and the area thereby diminished, yet, as the same amount is applied to each year alike, the results *comparatively* cannot be far wrong.

1883. Rainfall from June 1st to Dec. 1st	. .	$14\frac{25}{100}$ inches.
The Pond lowered same time .	$5\frac{12}{100}$ feet.	245,760,000 gallons.
The Pond supplied from rainfall and unseen sources same time		240,332,266 gallons.
Total amount pumped in six months .		486,092,266 gallons.

1884. Rainfall from June 1st to Dec. 1st	. .	$19\frac{84}{100}$ inches.
The Pond lowered same time .	$4\frac{33}{100}$ feet.	207,840,000 gallons.
The Pond supplied from rainfall and unseen sources same time		304,855,170 gallons.
Total amount pumped in six months .		512,695,170 gallons.

1885. Rainfall from June 1st to Dec. 1st	. .	$27\frac{57}{100}$ inches.
The Pond lowered same time .	$4\frac{34}{100}$ feet.	208,320,000 gallons.
The Pond supplied from rainfall and unseen sources same time		356,470,468 gallons.
Total amount pumped in six months .		564,790,468 gallons.

Work Done in and around Fresh Pond.

In anticipation of the introduction of the new water supply from Stony Brook, we have done what we could to finish the work, so well begun last year, of cleaning out the mud in the bottom of the Pond, and deepening the shallow places, which were laid bare by the very low stage of water. Especial attention has been paid to Boat-House Nook so called, lying along the railroad and southerly from the old Fresh Pond Hotel property. It is at this part of the Pond where our new supply will enter. The Nook has been cleaned out, a bank formed around the borders which have been thoroughly riprapped with stone and gravel, so that what was before an unshapely, shallow place, has been transformed into a handsome and well-formed basin, attractive to the eye, and a very much improved place for the storage of water for the use of our citizens. A driveway around its borders from Fresh Pond Lane, makes it a pleasant resort for our people who may wish to visit the place, and see what is to become to Cambridge, what Chestnut Hill Reservoir is to the city of Boston. No doubt it will be many years before everything that is desirable will be done about the Pond. But we have made a good beginning, although confined to what seemed necessary to do now.

The only remaining place around the Pond to which serious objection exists is Black's Nook, which is still a serious menace to the purity of our water. Although the water in the Pond for a large part of this year has been so low as to flow over but a very small part of the Nook, as a result a very heavy and objectionable vegetable growth now covers the Nook, which the next rise in the Pond must soak out, and then it will contaminate our water supply. We have made every effort to remove the objections to our making a dam at this point this year, but so far without success. We have offered to Mrs. Black, if she would remove the injunction from Court and allow us to go on and build the dam without further objections, the following propositions: —

First. We would build in the dam a sluiceway with gates in it, and when in the winter she wished to fill her ice house, we would, during the time of ice cutting, remove the gates so that she could cut a canal in the ice and float the cakes to rhe ice house, as she always did when the Pond was full.

Second. We would build a roadway over the Nook and the top of the dam, to her ice-house, so that she could, if she pleased, cut all her ice from the main Pond, and having raised it two feet over the dam it would run by gravity on slides, such as are used by the ice people, to her ice-house, or she could dispense with the slides and run the ice to her house on top of the ice in the Nook, which would always be frozen over, whenever there was ice fit to cut in the main Pond.

Neither of these propositions was acceptable, although they seemed to us fair. The prices named in the proposals of Mrs. Black to us seemed so high and unreasonable that, as a last resort, we made a proposal so fair, that we thought no one who was inclined to meet the city in this matter on an equitable basis, would or could reasonably decline it, to wit: —

Third. If she would remove the injunction and allow us to go on and build the dam as proposed without further objections, we would agree to leave the matter of damages to a disinterested referee, to be tried and settled on the merits of the case.

This proposal was also declined, and here the matter rests so far as negotiations are concerned. The suit will soon come up in the Supreme Court to be tried on its merits. In order to provide against the exigency of the injunction, now temporary, being made permanent, on the recommendation of this Board, your Honorable Body has instructed the Mayor to petition the Legislature at its coming session for the right to build the dam at this place by *special act.*

We deem it of great importance that we do this work while the Pond is low, as it can be done much better and cheaper than at any other time, and it is very desirable also that it be done before the water from Stony Brook is introduced into the Pond. It is our purpose to continue our efforts to accomplish this object until we succeed.

Additional Water Supply.

We stated in our last Annual Report that we had taken certain lands near the Pond and along the Watertown Branch Railroad for a pipe line. So many objections were made by the Fitchburg Railroad Company to our going there, and some doubt existing about our legal right to do so, that route was abandoned and a new one taken through private lands from Holworthy street to the Pond. The pipes for our conduit from Stony Brook to Fresh Pond, which had been contracted for at our last report, and some of them delivered, have since then been all delivered, with the special castings to go with them. The work of laying them commenced in Fresh Pond in February last, and that work was prosecuted with vigor whenever the weather would permit, until now the entire line of thirty and thirty-six-inch pipes is laid up to and partly across the dam at Stony Brook, which is now being built. With the exception of about two miles in Watertown the work of laying the pipe has been done by the day, and almost entirely by Cambridge men.

A contract was made in the early summer for the building of the dam at Stony Brook, and it was expected that the dam would be so far along that we could take water next spring to fill up our Pond. We made careful inquiry as to the character of the men to whom the contract was awarded, and the result was satisfactory. A contract was drawn according to the specifications, which had been fully advertised. The contract was signed and guaranteed by first-class bondsmen, and yet, after all that, before the coutractors had done two thousand dollars' worth of work, on the merest pretext, they sent us written notice that they would do no more work under the contract unless the price was greatly increased and the time very much extended. Every reasonable effort was made to induce them to go on with the work, and the extended time they asked was granted, but all efforts failed. This made it necessary to advertise for new proposals, and the contract was then awarded to Messrs. Henry H. Pike & Son, who have since prosecuted the work with commendable diligence. By this experience we lost two or three months of the best part of the year, and are not, therefore, so far advanced as we expected to be with this work. The time when we may expect to get water from Stony Brook we cannot now fix more definitely than to say some time next season. A very large amount of water has been running down Stony Brook this season. Within a few weeks the gauge showed as high as seventy million gallons per day after some of the heavy rains in November, while during the summer months it ran down as low as three million gallons daily.

Stony Brook is a quick stream, quickly enlarging in case of heavy rain, and quickly subsiding in a dry time. There is plenty of water, but to avail ourselves of it we must be prepared to catch and hold it when it comes, for our use when we need it. With Fresh Pond for our storage basin, we are amply prepared for many years to come, without further expense after the dam and basin at Stony Brook are completed. The time will come when it will be necessary for storage basins to be built near the head waters of Stony Brook and Hobbs' Brook, which unite some two miles above our dam. We have had a careful survey made of the head waters of Stony Brook, including Beaver Pond. A dam at a point on the brook below Beaver Pond, raising the water fifteen feet, will create a storage basin which will hold in store some seven hundred million gallons of water. Another dam on Hobbs' Brook will make a storage basin of nearly if not quite an equal capacity. In each of these cases there seems to be but one natural or feasible place to construct a dam, and both places are very favorable for such a structure. In anticipation of the future wants of the city, we have secured both of these sites for dams by taking two tracts of land of from ten to twenty acres each, which cover the only ground suitable for that purpose.

In the future, when the wants of the city for water have reached the capacity of the brook to supply through Fresh Pond, it will then only be necessary to build one of these dams and purchase the land for a storage basin, and so, as the demand increases, increase the supply.

The Borders of Fresh Pond.

Last year, in reference to securing the borders of Fresh Pond, and placing the same in the hands of the City, where we thought they should be, we wrote as follows:

"In 1875 the Legislature gave the city the right to take a strip of land five rods wide around the borders of the Pond (except where used for ice-cutting), for the purpose of preserving the purity of the water. In some places five rods wide might answer this purpose, but in other places, owing to the lay of the land, five rods is not enough. While it was not decided where the city would procure an additional and permanent supply of water, the Board did not feel like asking the City Council for the power to take this land, or purchase other needed land, to control the borders of the Pond and preserve the purity of the water. We are now unanimously of the opinion that the time has come when we should proceed under the Act referred to, and, by purchase, secure what land is needed for this purpose. We have therefore sent to you a communication setting forth briefly the facts in the case, and asking that the Water Board be authorized, by purchase or otherwise, to secure the necessary land around the Pond, to control the borders and preserve the purity of the water.

In connection with this it has been suggested that a road or drive-way might be made around the Pond, which, beside the additional value it would give to real estate in that neighborhood, would effectually shut off any building on its immediate borders, as the road could be so located as to make it, a large part of the way, the proper boundary of the land needed around the Pond. We are informed that the parties who own the land are nearly, if not quite, all willing to give the land, provided the city. will lay out the road. We think this matter is worthy of your careful consideration and prompt action.

In July last your Honorable Body passed an order, authorizing the Water Board "to take under the Acts of the Legislature, or otherwise procure by purchase, such lands around Fresh Pond as were necessary, in their judgment to preserve the purity of the water." Under this authority we have acted. Where it would answer the purpose we have taken five rods or less: in other cases we have negotiated until we have secured substantially the entire border of the Pond, with the small exceptions in five places where the ice houses are located, and which by law are exempt from taking, and can only be acquired by negotiation. Some of these ice-houses are valuable, and not particularly objectionable on the borders of our Reservoir, as at present conducted, using as the owners and ourselves do, every precaution that in conducting their business all chances of pollution of the water are reduced to a minimum. Under these circumstances we would not recommend the purchasing of them as a whole at present, leaving them for consideration in the future when they may become more objectionable, and waiting for favorable times when they can be purchased at less price, and the city with a much larger population than now can better afford to buy all the borders of the Pond, and hold it exclusively as a Reservoir, as Chestnut Hill Reservoir is held by Boston. What we have done now secures nearly all the borders of the Pond, and secures us against the erection of any more buildings, which we might have to buy at a later period at a greatly increased cost. We feel sure that in the near future our course in this matter will receive the unanimous approval of all our citizens.

General Remarks.

We wish to express our hearty approval of the course of the City Council in creating "a committee on Water Supply." This committee has aided the Water Board in various ways during the past year, and we trust it will be continued in the future. It is of great value as a means of communication between the City Council and the Board in matters which are constantly coming up. We wish also to express to the City Council our most hearty thanks for its coöperation, and the readiness with which it has looked into and examined the plans we have submitted to it in order that it might act understandingly in making the appropriations that we have asked for, in the prosecution of our work.

All the different branches of our work are in good condition, and the regular officers and employés under our charge have been faithful in the performance of their various duties. The Superintendent has had a large amount of extra work to look after, in the laying of nearly three-fourths of the pipe from the pond to Stony Brook, by the day, and the work about Fresh Pond. But with able assistants the work has been kept well in hand, and under many difficulties has been carried to a successful completion.

The office work under our Registrar has been promptly performed, and the accounts correctly kept; all have seemed to vie with each other to see which would do his part the best. For detailed statements of what has been done we refer you to the reports of the Superintendent and Registrar made to this Board, which we herewith submit as part of our Report. Also the reports of the Committee on Accounts, the Treasurer and Auditor.

We cannot close without referring to the cheerful and prompt response to our many calls made upon our City Engineer by us in the progress of the work; with the able advice of Mr. Crafts, as consulting and assistant Engineer, and a faithful corps of workmen in his department, all our calls have been met with the speedy performance of the needed work.

C. W. KINGSLEY,
L. M. HANNUM,
JOHN F. O'BRIEN,
K. S. CHAFFEE,
C. G. H. BENNINK,
JAS. M. W. HALL,
Water Board.

REPORT

OF

THE WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, DEC. 4, 1885

To the Cambridge Water Board:—

IN compliance with the requirement of the City Ordinance, I present the twenty-first annual report of the operations of this department, showing the receipts, expenditures, and abatements, together with a statement of the number of water-takers, fixtures, etc., for the year ending Nov. 30, 1885.

Amount of bills remaining unpaid Nov. 30, 1884:—			
Water-rates		$44.75	
Meter-rates		49.80	
Supplies and repairs		847.01	
Amount of bills placed in hands of City Treasurer for collection from Nov. 30, 1884, to Nov. 30, 1885:—		$941.56	
Water-rates		154,069.36	
Meter-rates		36,213.40	
Supplies and repairs		6,110.14	
Off and on water, fines, and seals		447.50	
Total bills			$197,781.96
There have been collected:			
Water-rates		$186,805.14	
Off and on, seals, and fines		447.50	
Supplies and repairs		6,250.55	
Total collections		$193,503.19	
There have been abated:—			
Water-rates	$3,144.48		
Supplies and repairs	6.50		
		3,150.98	
Amounts carried forward		$196,654.17	$197,781.96

Amounts brought forward		$196,654.17	$197,781.96
There remain unpaid :—			
Water-rates	$78.29		
Meter-rates	349.40		
Supplies and repairs	700.10		
		$1,127.79	
			$197,781.96

Expenditures.

Construction account (general)		$12,391.28	
Construction account (Stony Brook)		292,122.50	
Maintenance account, viz. :—			
Care and repairs	$18,564.27		
Pumping service	7,819.40		
New pumping service (salaries, coal, etc.,)	849.77		
Office expenses	2,681.07		
		$29,914.51	
Supply and repair account		4,491.97	
Total			$338,920.26

Abatements.

Water-rate bills to the amount of	$3,144.48	
Supply and repair bills to the amount of	6.50	
Total		$3,150.98

Charges for water-rates, when the supplies are afterwards shut off, or fixtures sealed, are necessarily abated before the accounts can be balanced. New charges are then made when the water is again let on.

Refunds.

Water-rates have been refunded to the amount of	$1,260.78
Which amount deducted from receipts	186,805.14
Leaves net receipts for water	$185,544.36
Add off and on, seals, and fines	447.50
Makes net receipts of rates, fines, etc.,	$185,991.86

Off and On.

Water has been shut off for non-payment of rates, or per order, on account of vacancy, and seals have been applied to fixtures by request of owners or occupants, as follows:—

Supplies shut off in 1885	407
" let on, shut off in 1885	305
" let on, shut off in previous years	41
New supplies let on	381
Seal-locks applied to fixtures in 1885	371
" removed, put on in 1885	149
" removed, put on in previous years	157

Statement of the yearly revenue received from water-rates, since the purchase of the Works by the city:—

From	April	28, 1865,	to Dec.	1, 1865	$32,367.19
"	Dec.	1, 1865,	"	1, 1866	40,073.27
"	"	1, 1866,	"	1, 1867	52,733.62
"	"	1, 1867,	"	1, 1868	63,747.42
"	"	1, 1868,	"	1, 1869	76,149.30
"	"	1, 1869,	"	1, 1870	92,606.95
"	"	1, 1870,	"	1, 1871	111,782.65
"	"	1, 1871,	"	1, 1872	127,201.30
"	"	1, 1872,	"	1, 1873	146,117.32
"	"	1, 1873,	"	1, 1874	153,634.27
"	"	1, 1874,	"	1, 1875	138,860.37
"	"	1, 1875,	"	1, 1876	179,166.76
"	"	1, 1876,	"	1, 1877	154,843.59
"	"	1, 1877,	"	1, 1878	157,443.91
"	"	1, 1878,	"	1, 1879	164,681.90
"	"	1, 1879,	"	1, 1880	173,325.49
"	"	1, 1880,	"	1, 1881	170,062.73
"	"	1, 1881,	"	1, 1882	177,430.80
"	"	1, 1882,	"	1, 1883	179,361.89
"	"	1, 1883,	"	1, 1884 (10 months)	161,526.27
"	"	1, 1884,	"	1, 1885	185,544.36

Comparative Statement.

	1884.		1885.	
Construction Account.				
Received				
Expended		$31,519.74	$12,391.28	
" (balance due city treasury last year)			43.04	
		$31,519.74		$12,434.32
Supply Account.				
Received		$4,855.66		$6,250.55
Expended		5.234.96		4,491.97
Excess of Expenditures		$379.30		
Excess of Receipts				$1,758.58
Maintenance Account.				
RECEIVED.				
Rates, fines, etc		$162,042.27		$185,991.86
EXPENDED.				
Care and repairs	$28,765.33		$29,914.51	
Interest on Water debt	84,451.00		92,725.00	
Paid to Sinking Fund Commis'rs	42.705.00	155,921.33	52,425.00	175,064.51
Excess of receipts		$6,120.94		$10,927.35
Construction Acc't. (Stony Brook.)				
RECEIVED.				
From bonds issued (par value)			$288,000.00	
From premium on bonds			19,550.40	
Commonwealth of Mass			15.73	$307,566.13
EXPENDED.				
Sundry bills			$292,122.50	
Balance of Appropriation			15,443.63	$307,566.13

1884. Maintenance Account, excess of receipts	$6,120.94
Supply Account, excess of expenditures	379.30
Excess of total receipts over total expenditures	$5,741.64
1885. Maintenance Account, excess of receipts	$10,927.35
Supply Account, excess of receipts	1,758.58
Excess of total receipts over total expenditures	$12,685.93
Expended on Construction Account (general)	12,434.32
Balance due Sinking Fund	$251.61

The excess of receipts for 1885, as shown in the above comparative statement, amounting to $251.61, has been carried to the Sinking Fund, as required by law.

Last year the City Council changed the date of payment of annual bills from July 1 to May 1, giving us but 10 months' receipts. This year we received a full year's receipts, and a marked increase in receipts in consequence.

Beside the manufactories, etc., supplied by meter, water is now supplied to 12,793 families, 819 stables, with 1,978 horses and 268 cows, 224 shops, 351 stores and offices, by the following fixtures, viz: —

15,672 faucets.
4,113 wash-basins.
2,626 wash-tubs.
2,329 bath-tubs.
6,254 pan-closets.
802 slop-closets.
21 hopper-closets
84 urinals.
47 yard hydrants.
4 fountains.
3 tumbler-washers.
998 hand-hose.

Also,

601 fire-hydrants (beside 4 on private premises).
13 fire reservoirs.
15 drinking-fountains in public squares.

The above is exclusive of the school-houses, engine-houses, police stations, and other city buildings, for which special rates are charged, except where meters are located.

All premises supplied with Fresh Pond water have been visited during the year, and from this inspection, aided by reports from plumbers, a considerable amount of water-rates has been added for fractional parts of the year.

Respectfully submitted,

WALTER H. HARDING,

Registrar.

REPORT

OF THE

COMMITTEE ON ACCOUNTS OF THE CAMBRIDGE WATER BOARD.

WE have examined the abstract of accounts as presented us by the Water Registrar, covering the records of the past year. We have compared these with the statements submitted to us by the City Treasurer and Auditor, and we find them to be correct and in agreement. Annexed is the financial statement, in brief, presented to us by the Water Registrar and verified by us: —

Amount of bills in hands of City Treasurer, Nov. 30, 1884: —			
For water-rates		$44.75	
" meter-rates		49.80	
" supplies and repairs		847.01	
			$941,56
Amount of bills delivered to the City Treasurer for collection during the year ending Nov. 30th, 1885: —			
For water-rates		$154,069.36	
" meter-rates		36,213.40	
" supplies and repairs		6,110.14	
" off and on, seals, and fines		447.50	
			196,840.40
Total bills			$197,781.96
Of these amounts the Treasurer has collected	$193,503.19		
Less refunded	1,260.78		
		$192,242.41	
Amounts carried forward		$192,242.41	$197,781.96

Amounts brought forward	$192,242.41	$197,781.96
Refunded as above	1,260.78	
Abated	3,150.98	
Balance uncollected, Nov. 30th, 1885	1,127.79	
		$197,781.96

JAS. M. W. HALL,
WM. E. RUSSELL,
C. G. H. BENNINK,
Committee on Accounts.

CAMBRIDGE, Dec. 1st, 1885.

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DEC. 1, 1885.

Water-rates unpaid Nov. 30th, 1884		$94.55	
Bills placed in hands of City Treasurer for collection from Dec. 1st, 1884, to Dec. 1st, 1885: —			
Water-rates from annual ledger	$141,301.40		
Water-rates from fractional ledger	12,674.18		
Water-rates from meter ledger	36,213.40		
Water-rates from building account	93.78		
Off and on, and fines	340.00		
Seals	107.50		
		190,730.26	
Total bills on rates, fines, etc.		$190,824.81	
Supply and repair bills unpaid Nov. 30th, 1884	$847.01		
Supply and repair bills placed in hands of City Treasurer for collection Nov. 30th, 1884, to Nov. 30th, 1885	6,110.14		
		6,957.15	
Total bills			$197.781.96
There has been collected, annual ledger	$139,225.08		
There has been collected, fractional ledger	11,608.63		
There has been collected, meter ledger	35,877.65		
There has been collected, building account	93.78		
There has been collected, off and on, and fines	340.00		
There has been collected, seals	107.50		
Total collections on rates, fines, etc.		$187,252.64	
Collections on supply and repair accounts		6,250.55	
Total collections		$193,503.19	
Amount carried forward		$193,503.19	

Amount brought forward		$193,503.19	
There have been abated, water rates	$3,144.48		
There have been abated, supplies and repairs	6.50		
		3,150.98	
There remain uncollected, water-rates	$427.69		
There remain uncollected, supplies and repairs	700.10		
		1,127.79	
			$197,781.96

Total collections	$193,503.19	
Less refunds	1,260.78	
Total net receipts		$192,242.41

Attest: WALTER H. HARDING,
Registrar.

REPORT

OF THE

SUPERINTENDENT OF THE WATER WORKS.

CAMBRIDGE, Dec. 1, 1885.

To the President and Members of the Cambridge Water Board: —

GENTLEMEN, — In compliance with the City ordinance, I herewith present my annual report upon the condition of the Works and the operations of the past year.

The total amount of water pumped was 1,125,252,287 gallons. Coal consumed per million gallons pumped, 1,602$\frac{2}{10}$ pounds. Water sold by meter, and that used for watering streets, 278,959,925 gallons, leaving as the amount for domestic use 846,292,362 gallons. Number of gallons daily for each inhabitant on whole amount pumped, 49$\frac{72}{100}$ gallons. Number of gallons daily for each inhabitant on amount for domestic use, 37$\frac{4}{10}$ gallons.

Stony Brook Extension.

The work of laying the 30-in. and 36-in. pipe line to Stony Brook was commenced in Fresh Pond, February 2d, and continued until the 11th, when all pipes in the Pond were laid. On account of cold weather, work was then suspended until March 11th, when it was resumed and pushed forward to its completion at Stony Brook (except about 650 ft. on the dam), on Nov. 14th. The total length of 30-in. and 36-in. pipe laid is 39,754 ft., divided as follows: —

8,329 feet from Fresh Pond to Union Market Station, Watertown, 30-inch.
14,105 feet from Union Market Station to Waltham line, 30-inch.
9,394 feet from Watertown and Waltham line to Foot-bridge, 30-inch.
3,100 feet from Foot-bridge to Waltham Pumping Station Road, 30-inch.
4,400 feet from Pumping Station Road to the Dam, 36-inch.
426 feet on the Dam, 30-inch.

39,754 feet.

There were set one 36-inch, nine 30-inch, two 12-inch, and thirteen 6-inch gates and seven air-cocks.

The section from Union Market Station to Waltham line was laid by contract with H. H. Pike & Son. The remainder of the work was performed by day labor under the immediate charge of Thomas Eames as foreman and Joseph Barker as time-keeper and assistant. Credit is due them for the faithful manner in which they performed their duties, the whole being completed without complaint or serious accident.

Street Main Pipe.

Main pipes have been laid in the following streets:—153 ft. of 4-in. in Eustis Court, 300 ft. of 4-in. in Harris Court, 478 ft. of 4-in. in Hurlbert St., 213 ft. of 4-in. in Foster St., 88 ft. of 4-in. in Rockingham St., 160 ft. of 2-in. in Norfolk Court, 930 ft. of 4-in. in Bolton St., 36 ft. of 6-in. in Carver St., 187 ft. of 4-in. in Lancaster St., 266 ft. of 4-in. in Jay St., 392 ft. of 6-in. in First St., 48 ft. of 4-in. in Elm St., 101 ft. of 1-in. in Union Court, 190 ft. of 4-in. in Douglass St., 67 ft. of 6-in. in Martin St., 84 ft. of 6-in. in Clay St., 120 ft. of 6-in. in Montgomery St., 60 ft. of 6-in. in Hastings Square, 57 ft. of 6-in. in Brattle and Riedesel Avenue, 206 ft. of 4-in. in Riedesel Avenue, 388 ft. of 6-in. in Cushing St., 120 ft. of 6-in. in Munroe St., 368 ft. of 8-in. in Albany St., 6 ft. of 6-in. in Norris St., 457 ft. of 4-in. in Norris St., 185 ft. of 4-in. in Franklin St., 227 ft. of 4-in. in Hancock St., 257 ft. of 8-in. in Mt. Auburn St., 208 ft. of 4-in. in Mt. Auburn St., 337 ft. of 1¼-in. in Concord Avenue, 243 ft. of 1-in. in Concord Avenue, 125 ft. of 4-in. in Sixth St., 9 ft. of 6-in. in Blackstone St., 129 ft. of 6-in. in Garfield St., 8 ft. of 6-in. in Inman St., 120 ft. of 4-in. in Parker St., 415 ft. of 4-in. in Howard St., 36 ft. of 4-in. in Ash St. Court, 9 ft. of 6-in. in Ellery St., 274 ft. of 4-in. in Cleveland St., 3 ft. of 6-in. in Flagg St., 162 ft. of 4-in. in Glenwood St., 290 ft. of 4-in. in Kinnaird St., 788 ft. of 6-in. in North St., substituted in place of 4-in. pipe removed. A pipe bridge has been built over the railroad at Mt. Auburn and connection made with the Cushing St. District. There are now an 8-in. and a 4-in line in that district.

High Service.

No extension of high-service pipes has been made. All on its lines are adequately supplied and the system is giving perfect satisfaction, no complaint of any kind having been made. The check-valve on Sparks St. has been removed.

New Supplies.

393 new supplies have been laid during the year, making at this date a total of 8,731. 19 old supplies have been removed and 80 have been furnished with sidewalk shut-offs.

Hydrants.

Ten new post-hydrants have been set during the year and two flush-hydrants have been removed, viz:—on Sparks St. in front of C. T. Russell's house and on North St. in front of Glass Co.'s Factory. The totals at date are 289 post-hydrants and 320 flush-hydrants. There are also five flush-hydrants on private premises viz:—two on premises of New England Glass Co. on North St., two on premises of Boston and Lowell Railroad Co. on Prison Point St., and one on premises of C. L. Jones & Co. on Pearl St. Thirteen street reservoirs are furnished with supplies. Thirteen new hydrant-boxes and sixty-seven gate-boxes have been set in place of decayed ones removed.

Leakage.

Six hundred and forty-eight leaks have been stopped viz:—six on 3-in. main, nine on 4-in. iron main, two on 4-in. cement main, five on 6-in. main, one on 8-in main, one on 12-in. main, one on 20-in. main, seventy-one on supplies in street, three supplies on premises, one at flush-hydrant, and five hundred and forty-eight on premises reported by inspector and repaired by owner or occupant.

All the fixtures throughout the City have been inspected once and nearly all of them twice.

All the main pipes in Ward 3 have been tested except the 10-in., 12-in. and 20-in. mains.

Drinking Fountains.

The drinking-fountain at Fifth and Cambridge Sts. has been discontinued and removed. A cesspool has been built around the fountain in Brattle Square and the fountain has been removed from Putnam Avenue at Pearl St. to Putnam Avenue at Brookline St. The number of fountains is fourteen.

Stand-pipes for Street Watering.

Two new stand-pipes for street-watering have been established viz:—on Concord Avenue in front of school-house, and at corner of Spruce and Cedar Sts. The number at this date is 40.

Fresh Pond.

The work of clearing out the Nook at the southerly corner of the Pond and improving the borders has been completed, and the banks are now thoroughly riprapped in this neighborhood from the high bluff, easterly around Boat-House Nook, to opposite the Fresh Pond Hotel. The old Boat-House has been removed, the old willow trees cut down and a very desirable improvement obtained. The road from Fresh Pond Lane to the Pond has been widened to 40 ft.

The water in Fresh Pond reached its highest point, 10.61, on May 4th, and its lowest, 5.95, on Oct. 29th. The auxiliary pumps were put in operation Aug. 17th, the water in the Pond being down to 7.70 or 1.30 below top of the conduit.

Pumping Works.

The wood work in the engine-house has been oiled and varnished, the engineer's house painted, the walks of the engine-house lot and Tudor Park graded, and the grass cut. A new fence should be built around both the above lots the coming season.

Reservoirs.

All of the large gates at and around the reservoirs have been repacked and tested and are in first-class condition. The capping stones of the high wall on Reservoir Street have been noticeably pushed out by the frost. There is a slight leak near the stand-pipe which will be repaired at an early day. The walks have been kept graded and the grass cut.

Spy and Little Ponds, Wellington Brook, and Conduit.

The houses and gates are in good condition. No water has been drawn from either pond. The filter-basin is in good order. Water was drawn from this source Feb. 10th to March 2d.

There is no change in the condition of Wellington Brook since last report. Water was taken from this source Jan. 17th to April 5th. The conduit appears to be in good condition.

Brookline Street Pipe Bridge.

The siphon has been pumped out and the pipe bridge is in good repair.

Pipe Yard.

The stable at the pipe yard has been raised and much improved by the addition of an L about 40 ft. long. The buildings are in good condition except the dwelling house, which needs shingling and painting.

The following tables show the locations of meters, fountains and stand-pipes, the details of main and supply extension, and the account of stock on hand.

Accompanying this report is that of the Engineer at the Pumping Station, with a full account of the operations at the engine-house.

Respectfully submitted,

HIRAM NEVONS,
Superintendent.

List of Meters in Use November 30, 1885.

Meters.	Locality.	Size.	Description.
Alghieri, Simon	Main st	⅝	Worthington
Andrews, D. H.	Sixth st	1	Union
American Rubber Co	Potter st	4	Crown
" " "	Potter st	6	Gem
American Net & Twine Co	Third st	1½	Worthington
American Steam Safe Works	Main st	1	"
Aquinas Hall	Harvard st	1	"
Barbour, W. O	Osborn st	1	"
Bay State Brick Co	Spruce st	⅝	"
Barnes, F. G. (Felton Hall)	Cambridge st	1½	"
Balcom, A. W.	Austin st	⅝	Union
Berry, Casper.	Elm st	1	Crown
Bird, H. M.	Broadway	⅝	Union
Bullock, O. S.	Broadway	⅝	Worthington
Burton, A. & E.	Harvard st	⅝	"
Boston Woven Hose Co.	Hampshire st	4	"
" " " "	Broadway	1½	"
Boston Stamping Co	Third st	2	"
Brown & Higgins	Sands st	1	"
B. & L. R. R., (Repair shop)	Bridge st	2	"
" " " (Round house)	Prison Point st	2	"
" " " " "	Prison Point st	2	"
" " " (Paint shop)	Prison Point st	1	"
" " " (Car-house)	Prison Point st	2	"
" " " (Filling locom.)	Prison Point st	6	Union
Carr Bros	Lopez st	1	Worthington
Cambridgeport Diary Co	Magazine st	1	"
Cambridge Gas Light Co	Third st	1½	Crown
" " " "	Ash st	⅝	Worthington
Campbell Bros	Main st	⅝	"
Charles River R. R. Co	Hampshire st	⅝	Crown
" " "	Brookline st	1	Worthington
" " "	Tremont st	⅝	Equitable
" " "	Green st	⅝	Worthington
City of Cambridge (Shepard sch.)	North av	2	"
" " (Ward 1 Bld.)	Brattle sq	1½	"
" " (" 4 ")	Central sq	1½	"
" " (Upton sch.)	Upton st	2	"
" " (Cemetery)	Coolidge av	4	"
" " (Almshouse)	Tannery st	2	"
Cambridge R.R.Co.(Paint shop)	Dunster st	⅝	"
" " (Repair shop)	Dunster st	⅝	"
" " (Car house)	Dunster st	⅝	"
" " (Wood stable)	Dunster st	⅝	"
" " (Brick stable)	Dunster st	⅝	"
" " (Office)	Harvard sq	⅝	Crown
" " (Washing cars)	Murray st	1½	"
" " (Stable)	Murray st	1½	Worthington
" " (Car-house)	Cambridge and Baldwin	1	Desper
" " (Stable)	Baldwin st	1	Worthington
" " (Brick stable)	Cambridge st	1	"
" " (Stable)	Cambridge st	1	"
" " (Stable)	Cambridge st	1	"
" " (Stable)	Mt. Auburn st	1	"
" " (Stable)	North av	2	"
" " (Stable)	Main st	2	"
" " (Stable)	River st	1	"
Cushman Bros	Main st	⅝	Desper
Close, George	Broadway	1	Worthington
Caswell & Coolidge	Franklin st	1½	"
Coleman, John & Son	Broadway	1	"
Clark, B. P. & Co	Main st	1½	"
Cochrane, A. & Co	Potter st	1	Crown
Cofran, S. M.	Concord av	2	Worthington
Coolidge, J. G. (Greenhouse)	Coolidge av	1	"
" " (Barn)	Coolidge av	2	"
Davis, Curtis & Co.	Broadway	2	"
Dugan & Rutherford	First st	1	Crown
Davis, J. C. & Son	Broadway	2	"
Daniels Badger & Co	First st	⅝	Worthington
Davenport, A. H.	Cambridge st	2	"
Dailey, C. W.	Cambridge st	1	"
Derby, H.	Main st	1	Crown

List of Meters (Continued).

Meters.	Locality.	Size.	Description.
Downing, Theo	Eustis ct	1	Worthington
Draper, Francis & Co	Otis st	⅝	"
De Rosay, L. E. & Sons	Dublin st	⅝	"
Dow, Davis & Co	Portland st	2	Crown
Dee, T. W.	Brattle st	1	Equitable
East Cambridge Club Stable	First st	1	Worthington
Episcopal Seminary	Brattle st	1¼	"
Farrell & Nagle	Frank st	1½	"
Fenton, N. & Co	Gore st	⅝	Desper
Gilmore & Eustis	Portland st	2	Worthington
Goepper Bros	Ninth st	1	"
Greely, Leander	Broadway	1½	"
Griffin & Dolan	Decatur st	⅝	Desper
Harvard College,(Holworthy Hall)	College grounds	⅝	Worthington
" " (Boylston Hall)	College grounds	2	Crown
" " (Stoughton Hall)	College grounds	⅝	Worthington
" " (Sever Hall)	Quincy st	⅝	Crown
" " (Thayer Hall)	Cambridge st	1½	Worthington
" " (In yard)	College grounds	1½	"
" " (Memorial Hall)	Cambridge st	2	"
" " (Boat-house)	Flagg st	¾	Desper
" " (Botanic Garden)	Garden st	1	Crown
" " (Gymnasium)	Cambridge st	1½	"
" " (Holyoke house)	Harvard st	2	Worthington
" " (Museum)	Divinity av	1	"
" " (Scientific sch.)	Kirkland st	⅝	Desper
" " (Law school)	Holmes place	1½	Worthington
" " (Laboratory)	Holmes place	1	"
" " (Jarvis field)	Everett st	⅝	Equitable
Hilton, J. M.	Harvard st	1½	Crown
Hazlett, W. H. & Co	Otis st	1½	Worthington
Hews, A. H. & Co	Richdale av	1	"
Hixon, Edw. & Co	Main st	1	Ball & Fitts
Houghton, H. O. & Co	Blackstone st	2	Worthington
Hovey & Co.	Cambridge st	1	"
Howe & Putney	Distillhouse st	1	"
Hopkins, J. H. T.	Prospect st	⅝	"
Harvard Skating Rink	Putnam av	⅝	"
Ivers & Pond (Factory No. 1)	Albany st	2	"
" " (Factory No. 2)	Albany st	2	Crown
Johnson & Doane	Green st	¾	Worthington
Jaques & Eustis	Main st	1	Crown
Jones, C. L. & Co	Pearl st	¾	Desper
Kemp, L. & Sons	Davis st	1	Worthington
Kennedy, F. A. & Co	Green st	1½	"
Kendall & Roberts (Engine room)	Main st	⅝	"
" " (Boiler shop)	Main st	⅝	Equitable
" " (Foundry)	Main st	⅝	Worthington
Low, J. W.	Reed st	1½	"
Little, Brown & Co.	Blackstone st	⅝	Ball & Fitts
Lamb & Ritchie	Albany st	⅝	Worthington
Mason & Hamlin	Broadway	1½	Crown
Middlesex Bleachery	Sacramento st	1	Worthington
Middlesex Co.(Court house)	Otis st	⅝	"
" " (Court house)	Thorndike st	⅝	Union
" " (H. of Correction)	Thorndike st	4	"
" " (Registry of Deeds)	Otis st	¾	Worthington
Millan, Alex	Brattle sq	⅝	Crown
Moore, Chas	Farwell place	1	Worthington
Moering, Mrs. A. L. (Beck Hall)	Main st	1	"
Murdock, W. H.	Grigg st	½	Desper
Mt. Auburn Corpt'n (Greenhouse)	Brattle st	1	Worthington
" " (Cemetery)	Mt. Auburn st	⅝	Desper
Maverick Oil Co	Sixth st	2	Worthington
New England Glass Works	North st	2	"
New England Hoop Dressing Co	Earle st	1	Crown
Norton, Edw. H	Winsor st	¾	Desper
North, C. H	Columbia st	2	Worthington
O'Brien, J. F	Coolidge av	¾	"
Page, Geo. G., Box Co	Hampshire st	2	"
Parry Bros. & Co	Raymond st	¾	"
Pike, Joel S. & Co	Church st	1	"

List of Meters (Continued).

Meters.	Locality.	Size.	Description.
Pike, Joel S. & Co	Palmer st	1	Ball & Fitts
Porcellian Club	Harvard st	1	Crown
Porter's Hotel	North av	⅝	Worthington
Ross, Mrs. H. P	Broadway	⅝	Equitable
Reardon, John & Sons	Waverly st	4	Worthington
Reardon, Wm	Portland st	2	Crown
Revere Sugar Ref. (North side)	Water st	3	Union
" " " (South side)	Water st	3	Worthington
Reversible Collar Co	Mt. Auburn st	1	"
Rawson & Morrison	Main st	⅝	"
Rideout, M. E.	State st	1	"
Roberts, O. P.	Brattle sq	1	"
Ross, A. M	Main st	⅝	"
Rogers, Geo. M	Washington st	3	"
Russell & Zeregas	State st	⅝	"
Standard Carpet Lining Co	Third st	2	Crown
Standard Turning Works	Broadway	1	Worthington
Sargent, Dr. D. A.	Palmer st	1	Ball & Fitts
Sands, M. W	Walden st	⅝	Worthington
Shorey, Geo. L	Soden st	1½	"
" "	Kinnaird st	2	"
Smart, D. C	Main st	2	"
Sortwell & Co	Distillhouse st	2	"
St. Mary's Orphan Asylum	Cambridge st	1	"
Squire, J. P. & Co	Gore st	4	"
" " (Stable)	Gore st	1	"
" "	Gore st	2	"
" "	Gore st	6	Gem
Slavens, J. W. L.	Bridge st	1	Crown
St. Mary's Church	Norfolk st	2	Worthington
Tower, Sylvester	Broadway	2	"
Thurston & Hall	Elm st	¾	"
Tug "Henry Chapel"	First st	2	Crown
Teele, Frank H	Lincoln ct	⅝	Worthington
Thayer, Henry & Co	Broadway	2	"
Tribune Publishing Co	Linden st	⅝	Crown
Tracy, M. F	Boylston st	1	Desper
Temple, F. L	Kirkland st.	2	Worthington
Union Pacific Tea Co	Main st	⅝	Union
Uhrig, Joseph	Main st	1½	Worthington
Union Glass Co. (Pot room)	Webster av	1	"
" " " (Packing room)	Webster av	¾	Crown
Varnum, W. H.	Putnam av	⅝	Worthington
Whitney, H. W	Main st	⅝	Crown
Wilson, John & Son	Brattle st	⅝	Worthington
Woodbridge, S. F.	Frank st	1	"
Wight & Scorgie	Mt. Auburn st	¾	Desper
Waitt & Watt	Otis st	1	Worthington
Woods, Paige & Co	Main st	⅝	"
Cambridge Y. M. C. A	Central sq	2	"

List of Drinking-Fountains, Nov. 30, 1885.

Bridge Street, junction of Cambridge Street.
Broadway, southwest corner of Norfolk Street.
Brattle Square, east side at Brewer's Block.
Brattle Street, junction of Fresh Pond Lane.
Central Square, west side.
Central Square, east side.
Hampshire Street, junction of Broadway.
Harvard Square, at the flag-staff.
Inman Square, east side.
Main Street, junction of Broadway.
Main Street, junction of Mt. Auburn Street.
North Avenue, southwest corner of Walden Street.
North Avenue, north side, west of Cameron Street.
Putnam Avenue, southwest corner of Brookline Street.

List of Stand-Pipes for Street Watering, Nov. 30, 1885.

Brattle Street, near University Press.
Brattle Street, corner Sparks Street.
Brattle Street, near Fayerweather Street.
Brattle Street, near Fresh Pond Lane.
Bridge Street, junction of Cambridge Street.
Broadway, near Third Street.
Broadway, corner of Sixth Street.
Broadway, corner of Winsor Street.
Broadway, junction of Hampshire Street.
Brookline Street, corner of Putnam Avenue.
Cambridge Street, near Warren Street.
Cambridge Street, near Winsor Street.
Cambridge Street, at Inman Square.
Columbia Street, near Austin Street.
Concord Avenue, in front of School-House.
Dana Street, corner of Chatham Street.
Gore Street, west of Third Street.
Green Street, near Western Avenue.
Harvard Street, corner of Prescott Street.
Inman Street, near Broadway.
Kirkland Street, near Quincy Street.
Main Street, near Portland Street.

Main Street, near Hancock Street.
Magazine Street, opposite Warland Street.
Mt. Auburn Street, near Athens Street.
North Avenue, near Common.
North Avenue, corner of Sacramento Street.
North Avenue, near Roseland Street.
North Avenue, near Beech Street.
North Avenue, near Spruce Street.
North Avenue, corner of Norris Street.
North Avenue, opposite Tannery Street.
Prison Point Street, opposite Round House.
River Street, near Putnam Avenue.
Sixth Street, near Thorndike Street.
Spruce Street, at Cedar Street.
Third Street, near Rogers Street.
Thorndike Street, near Third Street.
Western Avenue, near Howard Street.

Main Pipe Laid, Number of Gates and Fire Hydrants.

LOCATIONS.	IRON PIPES.		GATES.		HYDRANTS.	
	Length.	Size.	No.	Size.	No.	Size.
	Feet.	Inch.		Inch.		Inch.
Sparks Street			1	6	1	6
Eustis Court	153	4	..	..	..	
Harris Court	300	4	..	..	..	
Hurlbert Street	478	4	1	4	..	
Foster Street	213	4	..	..	..	
Rockingham Street	88	4	..	..	..	
Norfolk Court	160	2	..	..	..	
Bolton Street	930	4	1	4	..	
Carver Street	36	6	..	..	..	
Lancaster Street	187	4	..	..	..	
Jay Street	266	4	..	..	..	
North Street (relaid)	788	6	..	..	2	6
First Street	392	6	..	..	..	
Elm Street	48	4	..	..	..	
Union Street Court	101	1	..	..	..	
Douglass Street	190	4	1	4	..	
Martin Street	67	6	.	..	..	
Clay Street	84	6	..	..	..	
Montgomery Street	120	6	..	..	..	
Riedesel Avenue	206	4	..	..	..	
Brattle St. and Riedesel Av.	57	6	1	6	1	6
Cushing Street	388	6	..	..	1	6
Munroe Street	120	6	..	..	..	
Albany Street	368	8	..	..	..	
Hastings Square	60	6	..	..	..	
Norris Street	6	6	..	..	1	6
“ “	457	4	1	4	.	
Franklin Street	185	4	1	4	..	
Hancock Street	227	4	1	4	..	
Mount Auburn Street	257	8	1	8	..	
“ “ “	208	4	..	..	..	
Concord Avenue	243	1	..	..	..	
“ “	337	1¼	..	..	..	
Sixth Street	125	4	1	4	..	
Blackstone Street	9	6	..	..	1	6
Garfield Street	129	6	..	..		
Inman Street	8	6	..	..	1	6
Parker Street	120	4		..	..	
Howard Street	415	4	1	4	..	
Ash Street Place	36	4	..	..	..	
Ellery Street	9	6	..	..	1	6
Cleveland Street	274	4	.	..	..	
Flagg Street	3	6	..	..	1	6
Glenwood Street	162	4	..	..		
Kinnaird Street	290	4	1	4		
Stony Brook (day labor)	4,400	36	1 5	36 30		
“ “ “ “	21,249	30	8 4	6 30		
“ “ by contract	14,105	30	2 5	12 6		

Recapitulation.

	36 Inch.	30 Inch.	12 Inch.	8 Inch.	6 Inch.	4 Inch.	2 Inch.	1¼ Inch.	1 Inch.	Total
Length in feet of iron pipe	4,400	35,354	......	625	2,276	5,558	160	337	344	49,054
Number of gates	1	9	2	1	15	9	......	......	......	37
Number of hydrants	......	......	......	......	10	......	......	......	......	10

New Supplies.

GALVANIZED PIPE AND BRASS FITTINGS USED FROM DEC. 1, 1884 to NOV. 30, 1885.

	4 Inch.	3 Inch.	2 Inch.	1½ Inch.	1¼ Inch.	1 Inch.	¾ Inch.	Total
Length in feet of pipe laid	50	13	267	246	204	1,496	12,031	14,307
Number of supplies	2	1	7	7	5	20	351	393
Number of stop and wastes	4	......	7	7	5	20	352	395
Number of screw cocks	......	......	7	7	5	20	346	385
Number of sidewalk cocks	......	......	......	......	......	20	352	372
Number of stand-pipes	......	......	......	......	......	......	......	370
Number of boxes, frames, covers	......	......	......	......	......	....	......	20

List of Check-Valves.

OLD HIGH-SERVICE.

	Size in inches.
Lake View Avenue, 150 feet north from Huron Street............	10
Lake View Avenue, 150 feet north from Brattle Street...........	6
Fayerweather and Reservoir Streets................................	6
Concord Avenue, 135 feet south from Buckingham Street.........	6
Buckingham Street, 220 feet west from Concord Avenue..........	6
Garden and Linnæan Streets..	6
Raymond and Linnæan Streets.......	6
Avon Hill and Linnæan Streets..	6
Arlington Street, 230 feet west of North Avenue.................	6
Mt. Vernon Street, 100 feet west from North Avenue............	6
Mt. Pleasant Street, 150 feet south from Walden Street..........	6

List of Check-Valves.—Continued.

NEW HIGH-SERVICE.

	Size in inches.
Highland Street, on old 12-inch supply main	12
Dana Street and Broadway	4
Harvard Street, near Hancock	6
Centre Street, near Hancock	4
Dana Street, near Main	4
Harvard and Ellery Streets, two valves	6
Harvard and Trowbridge Streets, two valves	4
Harvard and Ware Streets	4
Harvard and Prescott Streets	4
Quincy Street, near Broadway	4
Broadway, on line of 6-inch pipe crossing College Grounds	6
Waterhouse Street, near small common	6
Kirkland and Cambridge Streets	10
Berkely Street, near Craigie	4
Appian Way, near Brattle Street	4
Linnæan and Lancaster Streets (old high-service extension)	6
Kirkland Street and Frisbie Place	4

Statement of Stock on Hand Dec. 1, 1885.

FOR STREET MAINS (IRON PIPE AND FITTINGS.)

	48 in.	30 in.	24 in.	20 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Straight pipes (12 feet each)	2	....	....	16	14	1	17	43	183	136	
Bends	....	2	1	....	3	1	...	6	12	9	1
Y Branches	....	....	1	1-12	....	1	....	....	....	....	
Sleeves	....	....	4	8	1	4	4	6	11	....	7
Clamp sleeves	....	....	4	4	2	4	6	13	6	16	5
Drain offsets	....	....	....	....	....	....	....	....	11	....	
Offsets	....	....	....	....	....	....	6	5	26	....	
Gates	....	....	....	....	...	....	....	1	5	1	
Check-valves	....	....	2	....	....	....	1	....	....	....	
Blow-off branches	....	....	3-6	2-6	....	....	....	....	....	....	
Caps	....	....	....	....	2	....	8	6	8	7	
Clamps for cement pipe	....	....	...	2	....	....	....	....	....	....	
T's	....	....	1-24	1-20	1-6	1-8	1-8	6-8	2-6	5-4	2-3
"	....	....	4-6	1-16	....	1-6	13-6	4-6	7-4	....	
"	....	....	....	1-12	....	....	....	....	....	....	
"	....	....	....	1-10	....	...	....	....	.. .	....	
"	....	....	....	2-6	....	....	....	....	....	....	
Crosses	....	....	....	1-20	1-12	5-10	2-10	1-8	6-6	16-4	1-3
"	....	....	....	2-10	3-6	5-4	2-8	1-4	9-4	....	
"	....	....	...	....	....	....	17-6	...	....	....	
"	....	....	....	....	....	....	1-4	....	....	....	
Reducers	....	....	1-10	1-12	1-8	....	3-8	2-6	10-4	9-6	4-4
"	....	....	....	1-10	....	....	2-6	....	....	....	
"	....	....	....	1-8	....	....	....	....	....	....	

FOR SUPPLIES (GALVANIZED PIPE AND BRASS FITTINGS).

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
Feet in length of galvanized pipe	374	897	352	300	1,091	
Elbows	30	52	8	40	144	
Street elbows	....	....	....	5	30	
Couplings	50	60	17	....	48	
Unions	50	40	....	65	86	
Faucets	....	....	....	12	14	20
Stop and wastes	12	16	17	38	180	
Screw-cocks	7	6	3	35	180	
Sidewalk cocks	....	....	....	18	26	
Screw-cocks for cement pipe	....	....	....	30	....	
Blow-off cocks	....	7	....	....	....	
Air-chambers	....	....	....	44	40	35
Socket end of rod	....	....	....	....	30	
Nipples	....	12	30	30	50	
Plugs, different sizes, 90	....	....	....	....	....	
Bushings, from 2 in. to ½ in., 230	....	....	....	....	....	
Fountain cocks	....	....	....	....	10	
Sill cocks	....	....	....	....	5	
Hose nipples	....	....	....	....	20	
T's	30	37	44	....	48	
Miscellaneous lot of cast iron T's and crosses	....	....	....	....	....	20
Caps	6	4	6	....	6	
Reducing couplings from 2. in. to ¾ in., 47	....	....	....	....	....	
Stand-pipes, 53	....	....	....	....	....	
Clips, 64	....	....	....	....	....	
Lead connections from 1½ to ¾ in., 13	....	....	....	....	....	
Hydrant cocks	....	....	....	....	4	

Stock in Shop and Yard.

3 hydrant-valves.
9 bolts for flush-hydrants.
4 stop and wastes for flush-hydrants.
5 lead kettles.
4 furnaces.
5 ladles.
3 bench vises.
4 drinking-fountains.
8 bands for capping main pipe.
3 meter boxes.
3 hydrant boxes.
4 gate boxes (small).
3 gate boxes (large).
12 cock boxes.
8 check valve boxes.
1 large frame and cover.
4 small frames and covers.
115 risers for boxes.
240 seals.
24 nuts.
4 axes.
5 sledge hammers.
10 gallons oil.
2 pair long leg boots.
1 cord wood.
25 feet ¾ inch hose.
100 feet 2-inch hose.
1 cask cement.
8 screw drivers.
6 saws.
1 square.
Plane, compasses, etc., for carpentering.
A lot of counters and ratchet movements for meters.
Lot of lumber.
11 spindles for 4-inch and 6-inch gates.
4 horses.
6 wagons.
7 harnesses.
2 sleighs.
1 double runner sled.
6 blankets.
2 buffalo robes.

3 oil-coverings for horses.
1 lathe with the usual chucks and tools.
1 water motor.
1 threading machine, with dies complete.
1 drilling machine, with drills complete.
2 tapping machines for supplies, with taps and drills.
4 hooks for tapping pipes.
2 2-inch taps and drills.
1 breast drill.
1 ratchet for tapping main pipe.
3 machines for tapping cement pipe.
1 washer cutter.
1 platform scale.
3 grindstones.
1 diaphragm pump.
1 hand pump.
8 thawing pumps.
200 feet thawing-out pipe.
1 barrel of clay.
1 hay-cutter.
1 large boom derrick.
3 small derricks.
1 breast derrick.
12 pipe wrenches.
2 nut wrenches.
5 monkey wrenches.
8 pipe cutters.
7 pipe tongs.
4 sets main pipe tools.
12 gate wrenches.
3 blow-off wrenches.
10 shut-off wrenches.
3 2-inch cock wrenches.
10 oil cans.
6 die plates, with dies complete.
4 tool chests.
2 hand carts.
3 chains.
68 shovels.
3 snow shovels.
50 picks.
17 trench rammers.
2 paving rammers.
8 pails.
5 iron bars.
36 wheelbarrows.
4 tamping bars.
1700 pounds lead.
180 pounds packing.
3 hydrant bodies.
1 set hydrant tools.
10 flush-hydrants.
5 post-hydrants.
6 garden-hydrants.
19 post-hydrant rods.
6 hammers.
1 plough.
1 dray.
17 wooden plugs.
82 blocks.
900 wedges.
1 3-inch Worthington meter.
1 2-inch “ “
3 1-inch “ “
5 ¾-inch “ “
5 ⅝-inch “ “
3 ¾-inch Crown meter.
1 ½-inch “ “
1 ¾-inch Desper meter.
1 ⅝-inch “ “

REPORT

OF THE

ENGINEER OF THE PUMPING STATION.

PUMPING STATION, CAMBRIDGE WATER WORKS,
DEC. 1, 1885.

Hiram Nevons, Esq., Superintendent: —

SIR, — I would report the engines and boilers in good condition. During the past year the tubes have been cut out of boilers Nos. 1 and 2, the boilers thoroughly cleaned and examined, and the tubes pieced out and reset. The furnaces of all the boilers have been relined with fire-brick and new grate-bars fitted to them; also a part of a sheet in the furnace of boiler No. 2 has been cut out and replaced with a new sheet. The lagging around the steam cylinders of engine No. 2 has been thoroughly overhauled and oiled, and the cylinder heads and steam chests covered with Fossil meal composition. Engine No. 1 has had the stuffing-boxes and glands on steam and water cylinders bored out and rebushed. The auxiliary pumps at the pond, were started on the 17th of August, and continue in operation at this time. Following will be found a statement of the expenses at the pumping station, with the usual table.

E. C. BROOKS,
Engineer.

Statement.

418 tons Cumberland coal at $4.77	$1,993.86
$387\frac{200}{2240}$ " " at $4.13	1,598.68
Oil, waste, packing, etc.	225.80
Repairs on engines and boilers	992.56
Gas and gas-fitting	137.59
Repairs on buildings and care of grounds	210.68
Salaries	3,510.00
Total	$8,669.17

Engine Record, Pond Levels, and Rainfall.

Date.	Low-service Engines.						High-service Engine.						Total water pumped.	Daily average water pumped.	Total coal consumed.	Daily average coal consumed.	Av'age height of pond.	Rain-fall.
	Total pumping time.		Daily average pumping time.		Total water pumped.	Daily average water pumped.	Total pumping time.		Daily average pumping time.		Total water pumped.	Daily average water pumped.						
	Hrs.	Min.	Hrs.	Min.	Gallons.	Gallons.	Hrs.	Min.	Hrs.	Min.	Gallons.	Gallons.	Gallons.	Gallons.	Lbs.	Lbs.	Feet.	Inch.
December, 1884..	373	35	12	03	83,573,400	2,695,916	373	35	12	03	5,782,810	186,542	89,356,210	2,882,453	149,500	4,823	9.17	4.60
January, 1885..	382	45	12	21	87,478,800	2,821,897	382	45	12	21	6,078,182	196,070	93,556,982	3,017,967	151,800	4,897	9.11	5.43
February, " ..	398	30	14	14	95,587,800	3,413,850	398	30	14	14	6,330,432	226,087	101,918,232	3,639,937	159,500	5,696	9.24	2.94
March, " ..	406	45	13	11	93,116,100	3,003,745	406	45	13	11	6,435,571	207,599	99,551,671	3,211,344	162,500	5,248	10.13	1.06
April, " ..	350	25	11	41	78,633,300	2,621,110	350	25	11	41	5,794,752	193,158	84,428,052	2,814,268	137,600	4,587	10.43	3.61
May, " ..	375	55	12	08	85,302,000	2,751,677	375	55	12	08	6,348,672	204,796	91,650,672	2,956,473	149,600	4,826	10.50	3.77
June, " ..	401	20	13	23	96,092,400	3,203,080	401	20	13	23	7,704,557	256,818	103,796,957	3,459,898	160,900	5,363	9.91	4.10
July, " ..	418	05	13	29	99,627,300	3,213,784	418	05	13	29	7,858,714	253,507	107,486,014	3,467,291	170,700	5,506	8.94	1.72
August, " ..	387	10	12	29	88,380,900	2,850,997	387	10	12	29	6,922,618	223,310	95,303,518	3,074,307	148,500	4,758	7.78	5.21
September, " ..	372	55	12	23	86,037,300	2,867,910	372	55	12	23	6,701,818	223,394	92,739,118	3,091,304	143,700	4,790	6.90	1.78
October, " ..	359	45	11	36	81,416,100	2,626,326	359	45	11	36	6,530,266	210,654	87,946,366	2,836,980	142,000	4,581	6.16	5.56
November, " ..	322	10	10	44	72,192,300	2,406,410	322	10	10	44	5,326,195	177,539	77,518,495	2,583,949	127,100	4,237	6.16	9.20
Total..........	4,551	20			1,047,437,700		4,551	20			77,814,587		1,125,252,287		1,803,400			48.98
Daily average..			12	28		2,869,693			12	28		213,191		3,082,884		4,941	8.70	

Stock on Hand Dec. 1, 1885.

600 tons Cumberland coal; 22 gallons cylinder oil; 30 gallons engine oil; 45 lbs. tallow; 90 lbs. cotton waste; 20 lbs. rubber packing; 30 lbs. usidurian packing; 5 lbs. asbestos packing; ½ bale flax packing; 24 9-inch rubber valves; 2 valve seats; 2 steam gauges; 10 lbs. Babbitt metal; 5 lbs. sheet brass; 15 lbs. soap; 1 barrel fire clay; 15 feet 5-inch rubber belting; ½ doz. files; 1½ lbs. emery; ½ doz. gauge glasses; 2 bbls. brimstone; 300 lbs. bolts and nuts; 10 lbs. nails; 1 pair plungers and rings for No. 2 engine; 1 lot iron pipe, assorted sizes; 1 lot pipe fittings, assorted sizes; 10 ft. 24-inch flange pipe; 8 ft. 6-inch flange pipe.

Tools, Furniture, and Instruments.

1 18-inch x 10 ft. engine lathe; 2 lathe chucks; 6 lathe dogs; 18 lathe tools; 1 grindstone; 13-inch x 9-inch engine; with shafting; belting, etc., 2 vises; 1 vise bench; 2 die plates and dies; 1 set pipe taps; 1 set hand taps; 2 pipe cutters; 14 pairs pipe tongs; 2 hand hammers; 1 copper hammer; 18 cold chisels; 8 files; 1 hand bellows; 5 screw wrenches; 3 Stillson wrenches; 22 fork wrenches; 27 socket wrenches; 6 gate wrenches; 1 hydrant wrench; 2 clamp screws; 1 sledge; 2 ratchets; 24 drills; 1 breast drill; 2 jackscrews; 6 steel bars; 2 soldering irons; 4 cylinder-head cranes; 12 eyebolts; 75 starting bolts; 1 starting key; 1 chain fall; 1 level; 1 gasket cutter; 2 ladles; 4 wooden horses; 1 oil cabinet; 1 set measures; 1 lot oil cans; 1 oil pump; 1 carpenter's bench; 4 planes; 3 hand-saws; 10 chisels; 7 gouges; 2 screw-drivers; 2 bit stocks; 13 bits; 3 augers; 1 draw-knife; 1 spokeshave; 2 axes; 1 square; 1 set fire tools; 1 coal car; 1 pair platform scales; 2 wheelbarrows; 10 scoop shovels; 1 tube brush; 1 forge; 1 anvil; 5 pairs tongs; 2 hand chisels; 1 lawn mower; 1 steel rake; 2 wooden rakes; 2 scythes; 4 forks; 1 weeder; 1 spade; 1 pick; 1 cast-iron roller; 6 ladders; 3 step-ladders; 200 ft. 2-inch hose and pipe; 100 ft. ¾-inch hose and pipe; 1 water-cooler; 6 fire pails; 8 water pails; 1 watering-pot; 1 window brush; 1 floor brush; 1 feather-duster; 1 dust-pan; 1 dust brush; 1 mop; 1 lot cocoa matting; 5 mats; 6 spittoons; 1 lot gas fixtures; 4 bracket lamps; 6 lanterns; 4 hand lamps; 1 desk; 2 tables; 2 clocks; 10 chairs; 1 barometer; 1 hygrophant; 1 thermometer; 2 rain gauges; 1 snow gauge.

Tools, Furniture, etc., at Engine House at Pond.

1 12x20-inch portable engine and boiler; 1 12x20-inch stationary engine; 1 40 H. P. locomotive boiler; 1 No. 2½ Blake pump; 1 12-inch centrifugal pump; 2 12-inch Follansbee propeller pumps; 1 Hancock inspirator; 1 lot shafting; pulleys and belting; 1 hand force pump; 100 ft. 1-inch fire hose and pipe, 30 ft. 1-inch rubber hose; 10 ft. ¾-inch steam hose; 1 set fire tools; 2 oil cans; 2 squirt cans; 2 dip nets; 1 belt awl; 1 belt punch; 1 lot belt lacings; 2 bracket lamps; 2 lanterns; 1 large lantern; 2 chairs; 1 stove and pipe; 1 cot bed and bedding.

EXPENDITURES OF WATER WORKS.

From the Auditor's Account.

Water Works (Construction).

Appropriation		$15,000.00
EXPENDED.		
For Bridge for water pipes at Mt. Auburn bridge	$347.03	
Castings	61.28	
Freight, on pipes	177.62	
Freight, on stone	235.00	
Galvanized pipe	163.25	
Hydrants	441.00	
Labor, as per pay-rolls	2,556.75	
Lead	156.94	
Meters	1,313.53	
Packing	38.09	
Pipe-fittings	82.11	
Water pipes	3,004.70	
Teaming	742.75	
Valves	105.60	
Water gates	382.00	
Wharfage	10.00	
	$9,817.65	
Add amount to be charged to construction from Stony Brook account	2,573.63	
As per item No. 51 of expenses		12,391.28
Amount unexpended		$2,608.72

Water Works (Maintenance).

Appropriation		$30,000.00
EXPENDED,		
For Analysis of water	$5.00	
Advertising	10.71	
Boots, and repairs	8.35	
Blanket and robe	10.75	
Belting, and repairs	15.99	
Carpenter work	467.71	
Car-tickets and fares	164.41	
Castings	348.77	
Care of lanterns	23.25	
Carriage, barge and horse-hire	95.50	
Cement	2.80	
Connecting catch-basins and fountain with sewer	31.26	
Cocks, couplings, fittings, and repairs	340.77	
Directory	2.50	
Damage to horse	25.00	
Expressage	98.76	
Fuel	4,464.32	
Gas	82.50	
Gas-piping and fittings	21.97	
Gate chamber	15.05	
Gaskets	17.25	
Gravel	1.00	
Hose, and repairs	43.00	
Hand-stamp	5.00	
Horse	125.00	
Hydrants and hydrant boxes	407.50	
Hardware, tools, and repairs	612.99	
Harness repairs	35.08	
Horse-shoeing	135.56	
Horse medicines	4.33	
Hay and grain	467.09	
Keys	1.25	
Amounts carried forward	$8,100.42	$30,000.00

Amounts brought forward	$8,100.42	$30,000.00
For Lumber	47.34	
Labor, as per pay-rolls	10,088.19	
Medical aid for injured man	8.00	
Meter, repairs	306.27	
Matting	27.95	
Machinist work	74.38	
Mason work	264.42	
Newspapers	16.50	
Oil and lanterns	123.41	
Plumbing	163.74	
Painting and glazing	234.59	
Printing	147.46	
Piping	37.20	
Pump	49.26	
Pipe jointers	35.00	
Packing	69.81	
Posts	2.00	
Printing of chronograph	10.00	
Polish for brass	2.00	
Pulleys	12.60	
Rent of wharf	50.00	
Roller	10.00	
Rent of office and shop	600.00	
Refreshments	55.05	
Repairing valves	5.13	
" boilers	467.18	
" engine	41.45	
Robe, exchange of	2.00	
Rope	35.57	
Salary of superintendent	2,000.00	
" registrar	1,525.00	
" foreman	1,085.00	
" clerk of board	200.00	
" office clerk	313.00	
" engineer	1,500.00	
Supplies	77.86	
Stationery	120.42	
Amounts carried forward	$27,787.78	$30,000.00

Amounts brought forward	$27,787.78	$30,000.00
For Stand-pipes	353.00	
Stove	20.20	
Sealing scales	1.12	
Stable (raising)	25.00	
Stable at yard	890.57	
Teaming	281.18	
Tags	2.50	
Tin pipe	16.00	
Thawing pipe	10.20	
Telegrams	1.78	
Veterinary surgeon	7.00	
Wagon, and repairs	346.85	
Witness	3.00	
Waste	13.40	
Work on fountain	34.51	
As per item No. 50 of expenses		29,914.51
Balance unexpended		$85.49

Water Works (Rates, Fines, etc.).

RECEIVED.

For rates, fines, etc., as per item No. 46 of receipts		$187,252.64
Deduct amount carried to interest on Water Loan	$92,725.00	
Deduct amount carried to Sinking Fund of Water Works	52,785.00	
Deduct amount carried to Water Works, maintenance	29 914.51	
Deduct amount carried to Water Works, construction	12,391.28	
	$187,815.79	

EXPENDED.

Deduct amount for Water Rates refunded, as per item No. 53 of expenses	$1,260.78	189,076.57
Excess of expenditure		$1,823.93

Water Works (Supplies).

RECEIVED.

For supply pipes and fittings, as per item No. 47 of receipts		$6,250.55

EXPENDED.

For labor, as per pay-rolls	$1,915.02	
Pipe fittings, etc.	2,576.95	
As per item No. 54 of expenses		$4,491.97
Unexpended balance		$1,758.58

Water Works (Construction, Stony Brook).

ADDITIONAL WATER SUPPLY.

Amount unexpended last year	$287,380.26
Additional appropriation, being premium and interest from sale of Bonds in 1884 and 1885	20,185.87
	$307,566.13

RECEIVED.

For Premium on Bonds, as per item No. 48 of receipts	$19,566.13

EXPENDED.

For Advertising	38.00	
Ballasting pipe line	3,033.75	
Blocks and wedges	448.88	
Boring apparatus, use of	110.00	
Borings	200.00	
Boundary stones	30.00	
Bricks	149.25	
Building dam, Kiernan & Grace	373.28	
" " H. H. Pike & Son	28,097.57	
Canvas	43.88	
Carpenter work	40.01	
Care of lanterns	43.50	
Car-fares and refreshments	2,759.91	
Carriage-hire	222.00	
Amounts carried forward	$35,590.03	$307,566.13

Amounts brought forward	$35,590.03	$307,566.13
For Carting pipe	242.47	
Castings	244.37	
Catch-basin and chamber	50.46	
Cement	42.90	
Cement tester	35.00	
Cleaning office	.75	
Cleaning private way	72.25	
Copy of plan	2.00	
Culvert alterations	779.62	
Damage for stopping of mill	229.24	
Drain pipe	32.52	
Driving piles	354.82	
Empty barrels	2.25	
Engraving bonds	725.00	
Excavating for line of pipes	664.96	
Expressage	.51	
Fitchburg R. R., labor laying pipe	39.70	
Freight on pipes	4.34	
Fuel	573.30	
Gas-fittings	70.47	
Gate box	5.00	
Grading pipe line, J. J. & T. F. Maney	18,528.90	
Grading pipe line, John Brasil	356.24	
Grate and frame	7.50	
Gravel	266.80	
Hardware, tools, and repairs	532.85	
Harness	35.00	
Iron beams as supports for pipes	31.88	
Labor, as per pay-roll (engineers)	8,188.45	
“ “ “ (laborers)	34,576.11	
“ “ “ (laborers, Fresh Pond)	1,943.37	
Labor, carting at Fresh Pond	961.92	
Lanterns and oil	20.45	
Lead	6,411.55	
Legislative expenses	700.00	
Amounts carried forward	$112,322.98	$307,566.13

Amounts brought forward . . .	$112,322.98	$307,566.13
For Lumber	454.30	
Mason work	274.90	
Moving coal	44.32	
Packing	280.04	
Plumbing	34.02	
Police, special	532.48	
Posts	45.00	
Powder	71.65	
Printing	132.50	
Pumps and machine work . .	1,713.97	
Pump house	230.00	
Reading gauge at Stony Brook .	49.90	
Repairing fence	10.00	
Reporting, short hand . . .	484.17	
Right of way through Waltham cemetery	5,000.00	
Right of way through Stickney estate	300.00	
Rolling truck	5.00	
Sand	4.00	
Scale	6.00	
Scully & Gill, contract for preparing basin at Roberts' mill	7,047.05	
Serving notices	24.00	
Stakes	.75	
Stone	12.25	
Stone, (covering,) and labor .	64.40	
Stone work	13.00	
Supplies	116.84	
Surveys	53.30	
Tarred pipe	1.50	
Teaming	1,984.35	
Telegrams	4.73	
Use of boat	15.00	
Use of derrick, &c.	154.00	
Valve, rubber, and repairs . .	11.00	
Water	31.66	
Amounts carried forward . .	$131,529.06	$307,566.13

	Amounts brought forward . .	$131,529.06	$307,566.13
For	Water pipes	150,849.40	
	Water-gates	4,354.50	
	Water pipes, laying	7,652.56	
	Work on gas-pipes	42.50	
	Work at Roberts' mill . . .	93.11	
	Working pump	175.00	
		$294,696.13	
Deduct bills carried to Water Works, (construction)		2,573.63	
As per item No. 55 of expenses			292,122.50
	Balance unexpended		$15,443.63

REPORT

OF THE

TRUSTEES OF THE SINKING FUND OF THE CAMBRIDGE WATER WORKS.

To the Honorable the City Council:—

THE undersigned, Trustees of the Sinking Fund of the Cambridge Water Works, herewith submit their annual report of the fund committed by law to their charge:—

The amount of the fund Nov. 30, 1884, was . .	$787,161.56	
Amount received during the year as interest on investments	38,542.14	
Amount received during the year from the City of Cambridge, derived from the annual water-rates, and being equal to three per cent on the amount of outstanding water bonds	52,785.00	
		$878,488.70

CONTRA.

Amount paid as accrued interest on securities purchased for investment	$579.07	
Amount paid as premium on securities purchased for investment	3,536.25	
		4,115.32
Leaving the amount of the fund Nov. 30, 1885, all securities taken at par		$874,373.38

The following is a list of the securities belonging to the fund, Nov. 30, 1885:—

Cambridge water loan, six per cent coupon bonds, maturing April 1, 1887	$6,000.00
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1888	25,000.00
Amount carried forward	$31,000.00

Amount brought forward	$31,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing May 1, 1889	8,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1890	31,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing May 1, 1891	26,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1892	1,000.00	
Cambridge Water Loan, four per cent coupon bonds, maturing Nov. 1, 1894	6,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing April 1, 1895	37,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1896	46,000.00	
Cambridge Water Loan, six per cent coupon bonds, maturing July 1, 1897	16,000.00	
Cambridge Water Loan, five per cent registered bond, maturing July 1, 1898	12,500.00	
Cambridge Contingent Loan, four per cent note, dated Dec. 1, 1883	200,000.00	
		$414,500.00
City of Boston, five per cent coupon bond, maturing Jan. 1, 1886	$1,000.00	
Town of Brookline, $3\frac{65}{100}$ per cent coupon bond, maturing Feb. 1, 1886	1,000.00	
City of Burlington, Vt., six per cent coupon bond, maturing July 1, 1886	500.00	
City of Boston, five per cent coupon bonds, maturing Jan. 1, 1887	2,000.00	
Town of Southboro, four per cent bonds, maturing March 25, 1887	2,000.00	
Town of Southboro, four per cent bonds, maturing March 25, 1888	2,000.00	
City of Columbus, Ohio, seven per cent coupon bonds, maturing Aug. 1, 1888	10,000.000	
City of New Bedford, four per cent coupon bonds, maturing Oct. 1, 1889	8,000.00	
Town of Southboro, four per cent bonds, maturing March 25, 1890	6,000.00	
City of Gloucester, 4½ per cent bond, maturing July 1, 1890	5,000.00	
Town of Norwalk, Conn., four per cent coupon bonds, maturing at pleasure of town after Jan. 1, 1891	20,000.00	
Town of Hyde Park, four per cent bonds, maturing July 1, 1891	5,000.00	
Town of Waltham, four per cent coupon bonds, maturing Sept. 1, 1891	46,000.00	
Amounts carried forward	$108,500.00	$414,500.00

Amounts brought forward	$108,500.00	$414,500.00
City of Salem, four per cent coupon bonds, maturing July 1, 1892	17,000.00	
Town of Stoughton, four per cent coupon bonds, maturing Aug. 10, 1893	2,000.00	
City of Dayton, Ohio, four per cent coupon bonds, maturing Sept. 1, 1893	6,000.00	
City of Keene, N. H., four per cent coupon bonds, maturing July 1, 1894	5,000.00	
Town of Hopkinton, four per cent coupon bonds, maturing Oct. 1, 1894	5,000.00	
City of Fall River, four per cent coupon bonds, maturing May 1, 1895	9,000.00	
City of Keene, N. H., four per cent coupon bonds, maturing July 1, 1895	3,000.00	
Town of Stoughton, four per cent coupon bonds, maturing Aug. 10, 1895	2,000.00	
City of Fall River, five per cent coupon bonds, maturing May 1, 1898	2,000.00	
Town of Arlington, five per cent coupon bonds maturing July 1, 1898	30,000.00	
City of Boston, four per cent coupon bonds, maturing Jan. 1, 1899	50,000.00	
Town of Pawtucket, five per cent coupon bonds, maturing April 1, 1899	25,000.00	
City of Providence, 4½ per cent coupon bonds, maturing June 1, 1899	21,000.00	
City of Boston, four per cent registered bond, maturing April 1, 1900	4,000.00	
City of Fall River, four per cent coupon bonds, maturing Aug. 1, 1900	13,000.00	
City of Lawrence, four per cent coupon bonds, maturing July 1, 1904	18,000.00	
City of Dayton, Ohio, four per cent coupon bonds, maturing May 1, 1905	50,000.00	
City of Providence, five per cent registered bonds, maturing July 1, 1906	50,000.00	
Town of Winchester, four per cent coupon bonds, maturing May 1, 1908	10,000.00	
Town of Beverly, four per cent coupon bonds, maturing July 1, 1911	20,000.00	
		$450,500.00
Cash in First National Bank of Cambridge		9,373.38
		$874,873.38

The bonded water debt, which the foregoing fund is expected to pay, matures as follows, viz.: —

July 2, 1886	$100,000.00
April 1, 1887	150,000.00
April 1, 1888	175,000.00
May 1, 1889	112,000.00
July 1, 1890	60,000.00
May 1, 1891	50,000.00
July 1, 1892	335,000.00
April 1, 1894	150,000.00
Nov. 1, 1894	36,000.00
April 1, 1895	160,000.00
July 1, 1896	103,000.00
July 1, 1897	16,000.00
July 1, 1898	12,500,00
May 1, 1910	288,000.00
	$1,747,500.00

There is little to note in the transactions of the past year beyond the fact that the entire income of the fund has gone to swell the principal, making the fund now what will be its maximum for a good many years. During the next seven years an average amount of $140,000 of our water bonds will mature each year requiring a heavy payment from the principal of this fund. This will be satisfactory for two reasons at least; first, in cancelling so many of our *six per cent* bonds, and second, in relieving the Trustees of the somewhat difficult task of investing its annual income.

Respectfully submitted,

Wm. E. RUSSELL,
C. G. H. BENNINK,
Wm. W. DALLINGER,
Trustees of the Sinking Fund of the Cambridge Water Works.

CAMBRIDGE WATER BOARD, 1886.

CHESTER W. KINGSLEY . . . . *President.*

Members of Board.

THE MAYOR,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*
KNOWLTON S. CHAFFEE, *term expires* 1890
JOHN F. O'BRIEN, " " 1889
LEANDER M. HANNUM, " " 1888
CHESTER W. KINGSLEY, " " 1887
JAMES M. W. HALL, " " 1886

JUSTIN A. JACOBS, *Clerk.*

HIRAM NEVONS, *Superintendent of Works.*
WALTER H. HARDING, *Water Registrar.*

Trustees of Sinking Fund of Water Loan.

THE MAYOR,
CITY TREASURER,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

City of Cambridge.

THE

TWENTY-SECOND ANNUAL REPORT

OF THE

CAMBRIDGE WATER BOARD

TO

THE CITY COUNCIL

TOGETHER WITH THE

REPORTS OF THE REGISTRAR AND SUPERINTENDENT,
AND OTHER DOCUMENTS.

FOR THE YEAR 1886.

CAMBRIDGE:
H. E. LOMBARD, BOOK AND JOB PRINTER,
636 MAIN STREET.
1887.

City of Cambridge.

32031

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TWENTY-SECOND ANNUAL REPORT

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☆ CAMBRIDGE PUB. LBRY

CAMBRIDGE WATER BOARD, 1887.

CHESTER W. KINGSLEY . . . . *President.*

Members of Board.

THE MAYOR, PRESIDENT OF COMMON COUNCIL,	*ex officiis.*	
JAMES M. W. HALL,	*term expires*	1891
KNOWLTON S. CHAFFEE,	" "	1890
JOHN F. O'BRIEN,	" "	1889
LEANDER M. HANNUM,	" "	1888
CHESTER W. KINGSLEY,	" "	1887

WALTER H. HARDING, *Clerk.*

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WALTER H. HARDING, *Water Registrar.*

Trustees of Sinking Fund of Water Loan.

THE MAYOR,
CITY TREASURER,
PRESIDENT OF COMMON COUNCIL, } *ex officiis.*

REPORT

OF THE

CAMBRIDGE WATER BOARD.

To the Honorable City Council of the City of Cambridge:—

THE Water Board as required by the city ordinance herewith submits its twenty-second annual report, being for the year ending November 30, 1886.

Total Cost of the Water Works.

Cost of the Works, Nov. 30, 1885, as per last year's report.	$2,087,378 49
Expended during the year ending Nov. 30, 1886 on construction account	206,664 90
Making the total expenditure	$2,294,043 39

Water Bond Account.

Whole amount of bonds issued	$2,256,900 00
Amount paid from Water Loan Sinking Fund	391,400 00
Leaving unpaid Water Loan	$1,865,500 00
From this deduct the present value of the Water Loan Sinking Fund as per Trustee's Account	892,005 97
Leaving the balance of Water Loan yet to be provided for by the Sinking Fund . . .	$973,494 03

Statement in brief showing the transactions in connection with the Water Works for the year ending Nov. 30, 1886.

General Construction Account.

RECEIVED.

Amount of Water Bonds issued	$18,000 00	
Premium on sale of same . .	232 20	
Refund of overcharge	1 50	
From excess of rates, fines, etc.	1,048 98	
		$19,282 68

EXPENDED.

Amount expended on general construction account	$19,282 68

Stony Brook Construction Account.

RECEIVED.

Balance of appropriation from 1885	$15,443 63	
Amount of Water Bonds issued	125,000 00	
Premium on sale of same . .	322 50	
Sale of wood at Roberts basin .	78 75	
		$140,844 88

EXPENDED.

On Stony Brook construction account	$122,652 42	
Balance unexpended to new account	18,192 46	
		$140,844 88

Fresh Pond Land Construction Account.

RECEIVED.

Amount of Water Bonds issued on this account	$90,000 00	
From sale of old material . .	2,750 00	
		$92,750 00

EXPENDED.

For purchase of sundry estates bordering on Fresh Pond, examination of titles, etc., .	$64,729 80
Balance unexpended to new account . . .	28,020 20
	$92,750 00

Water Rates, Fines and Supply Account.

RECEIVED.

From water-rates	$200,600 13	
Less rates refunded	1,195 70	
		$199,404 43
Shutting off and letting on water, seals and fines . . .	424 90	
From supply account. . . .	7,273 43	
Accrued interest on $43,000 Water Bonds dated Nov. 1, issued Dec. 3, 1886	135 90	
		207,238 66

EXPENDED.

For general construction account	$1,048 98	
For Maintenance account . .	29,858 33	
For supply account	5,948 62	
For interest on Water Loan . .	99,015 00	
Paid into Sinking Fund, being three per cent. on $1,922,500 Bonds outstanding	57,675 00	
Surplus of 1866, to Sinking Fund	13,697 73	
		207,238 66

Comparative Receipts.

Water-rates for the year ending Nov. 30, 1886	$199,404 43
Water-rates for the year ending Nov. 30, 1885	185,544 36
Showing excess of Water-rates in 1886 . .	13,860 07

Water Supplied.

Amount of water pumped in 1886	1,235,558,878 gallons
Amount of water pumped in 1885	1,125,252,287 gallons
Showing an increase in 1886 of	110,306,591 gallons

This is the largest amount of water ever pumped in one year, showing a daily average increase of 302,209 gallons, over the preceding year.

In 1885, the daily average increase over 1884 was	448,968 gallons
In 1886, the daily increase as above shown was	302,209 gallons
Making the daily increase in two years to be	751,177 gallons

Surely no argument could be more conclusive that our additional water supply will come none to soon for the requirements of our city.

The water during the past year has been used as follows:—

Amount sold by meter and used for watering the streets	317,048,175 gallons
Amount used for domestic and other purposes	918,510,703 gallons
Making the total	1,235,558,878 gallons
Daily average pumping	3,385,093 gallons
Divided as follows:—	
Daily average high service	260,087 gallons
Daily average low service	3,125,006 gallons
	3,385,093 gallons

The high service is furnished to the highest places in our City through the Stand pipe at the Reservoir, while the low service is supplied direct from the Reservoir, there being about forty feet difference in the level of these two scources of supply.

Rainfall and Height of Water in the Pond.

MONTHS.	RAINFALL.			WATER IN THE POND BELOW HIGH-WATER MARK.		
	1884.	1885.	1886.	1884.	1885.	1886.
	Inches.	Inches.	Inches.	Feet.	Feet.	Feet.
December, 1885	2.94	4.60	1.82	11.10	7.68	10.13
January, 1886	4.81	5.43	6.41	10.67	7.71	9.67
February, "	6.67	2.94	7.35	8.89	7.61	6.29
March, "	4.91	1.06	3.49	5.90	6.72	3.83
April, "	4.22	3.61	2.43	2.99	6.42	3.21
May, "	3.18	3.77	3.92	3.01	6.35	3.55
June, "	3.79	4.10	1.48	3.68	6.94	4.31
July, "	4.56	1.72	3.54	4.33	7.91	5.45
August, "	4.76	5.21	3.20	4.83	9.07	6.40
September, "	.70	1.78	4.64	5.68	9.95	7.59
October, "	2.90	5.56	3.62	6.67	10.69	8.87
November, "	2.63	9.20	4.22	7.34	10.69	9.62
Total for the year.	46.06	48.98	46.12	6.26	8.15	6.58

It will be seen by this table that while the amount of water pumped this year was more than ever before, yet we had about one foot more water in the Pond at the end of the year. This is because of the large amount caught last spring, so that in the month of April this year there were over three feet more water in the Pond than in April 1885, and yet the Pond lacked more than three feet of being full this year.

Fresh Pond Reservoir.

The work of preparing Fresh Pond as a Reservoir and Storage Basin for Stony Brook water which was so well begun last year, has been continued this year on a still larger scale, so that now we may say that the Reservoir is nearing its completion. We will present what has been done under different heads, to wit:—

First. Land purchased around the Pond. We have purchased, and paid for, the following estates on the borders of the Pond:

Lot of Market National Bank of Boston . . .	$25,000 00
Lot of Charles Moore.	1,500 00
Lot of Amos Stone	2,860 00
Lot of Sargent estate (F. J. R. Bullard) . . .	2,463 18
Lot of Bright estate (Artemus White) . . .	6,262 62
Lot of Thomas J. Hittinger	2,440 00
Lot of Tudor Heirs (S. E. Sewall *et. al.*, Trustees,)	1,250 00
Lot of Warren Institution for Savings	17,500 00
Lot of R. D. Smith, Trustee, ...	2,000 00
Lot of Mary Black	3,000 00
And examination of titles, stone bounds, etc. .	454 00
	$64,729 80

Nearly all these purchases were made at their tax appraisal.

We have taken under the power granted by the Legislature, portions of the following estates bordering on the Pond, after having tried to procure the land we needed by negotiating with the owners, but we failed in our efforts to secure it of them at any reasonable price. Say land of "John E. Somers," "The estate of William Gay," and "The Middlesex Institution for Savings." In settling for these lands taken we must await the action of those from whom the land has been taken. In our opinion if a settlement is made at any reasonable price, the unexpended balance of the appropriation made by the City Council for this purpose will be nearly enough to pay for the land taken, and pay for Child's Lot to be acquired hereafter.

The results of our purchases, and takings, may be summed up as follows: The entire border of Fresh Pond before the dams were made which cut off the nooks, measured about sixteen thousand feet. The city is now the owner of all this border, with the exception of the frontage on the Pond of Childs, Hittinger, and the Tudor Ice Company, in all measuring sixteen hundred and seventy feet, in other words the city now owns about nine-tenths of the shore of the Pond, and such other land contiguous thereto as seemed necessary for the purpose of completing the Reservoir and preserving the purity of the water therein.

Second. Roadway around the borders of the Ponds.

The roadway which had been built last year partly around the shore of the Pond, has been continued this year until it has been completed all around the Pond with the exception of 1540 feet in front of Hittinger's, and the Tudor ice houses. The same has been graded from thirty to forty feet wide, and put in good condition for pleasure driving; thus a carriage road on the borders of the Pond is now made nearly two and one-half miles long, which, when it becomes known to our citizens no doubt will attract many visitors; indeed, already some of our best citizens have been up there during the past season while the work was progressing, and we have heard many words of commendation on the improvements being made, while we have yet to hear the first word of dissatisfaction from any one.

Third. Riprapping the shores with stone.

While the roadway makes a very pleasant drive, and adds much to the beauty of the surroundings of the Reservoir, yet in fact the making of the roadway has been only incidental to preparing the shore with a proper embankment upon which stones could be placed to make a clean and proper basin in which to hold the water for our daily use. This riprapping follows the roadway all the way, and the banks are stoned in front of Hittinger's and Childs' ice houses, leaving only about 1000 feet of the shore in front ofthe Tudor ice houses, that is not thus riprapped and finished. We hope to make some arrangements with the Boston Ice Company who have bought the Tudor ice houses, so that this short piece can be graded, and finished to correspond with rest of the shore of the Reservoir. In making these improvements nearly all the material, except the stone, has been taken from the bottom, and the banks of the Pond, which were covered with water at a full pond, so that while the lines and curves of the shore have been made true and uniform, adding much to the beauty of the border and roadway, we have at the same time been adding to our storage capacity by taking the material out of the Pond to do it.

During the latter part of the season a dam was built across the entrance of Black Nook, of which so much has been said in years past, and this place will no longer pollute our water supply.

We have thus set forth what has been done to give the city a beautiful Reservoir of 160 acres, properly prepared and secured in its surrounding, capable of holding above grade 9, or the top of the conduit leading to our Pumping Station 400,000,000 gallons of water. If Cambridge Nook and Boat House Nook, were deepened two or three feet we should have all we could desire in Fresh Pond Reservoir.

Stony Brook Dam and Basin.

The work has progressed in some parts of it during the whole year, but it is not yet done. We had hoped that in this report we could have reported the work completed and ready to furnish water to fill our Reservoir at the next spring's snow-melting. The work of cleaning out and shaping the basin is all done. The grading of the dam is nearly done, about one-third of the face of the dam is paved. The stone work of the gate-house and overflow dam are the most behind. Our contractors claim that the delay in the stone work has been the fault of the party who contracted with them to furnish the stone last summer. New arrangements have been made and the stones are now coming forward, and the work will be pushed as fast as the weather will permit.

The pipes are all laid and connected with the gates at the Gate House. We are now filling the pipes, by pumping into them with a steam fire engine, our object being to test them under 100 pounds pressure in order to see whether everything is right on the pipe line, our contract for pipe requiring them to stand this test.

The following statement will show what has been spent on "Stony Brook construction account," up to this time.

Work done at Stony Brook Basin and Dam, including the laying of the Conduit to Fresh Pond.

Stony Brook Construction Account.

RECEIVED.

1884, appropriation by the City Council	$500,000 00	
Premium and accrued int. on $12,000 Water Bonds . . .	619 74	
1885, Premium and accrued int. on $288,000 Water Bonds .	19,550 40	
Commonwealth of Mass. (½ expense of survey)	15 73	
1886, Premium on $25,000 Water Bonds	322 50	
Sale of wood at Roberts Basin	78 75	
		$520,587 12

EXPENDED.

1884, Sundry bills paid and work done	$12,619 74	
1885, Sundry bills paid and work done	$292,122 50	
1886, Sundry bills paid and work done	$122,652 42	
Total expenditures to Nov. 30, 1886	$427,394 66	
Balance of appropriation . .	93,192 46	
		520,587 12

Of the above amount expended, $33,803.75 has been spent, in and around Fresh Pond in transforming it from a water supply into a Reservoir and Storage Basin.

Estimate for completing "Stony Brook construction account" exclusive of land and water damages.

Amount withheld from Woods & Co.	$3,000 00
Draft due H. H. Pike & Son, Nov. 30, 1886	6,717 60
Amount withheld on work performed	28,286 76
Estimated amount to finish contract at Dam	15,000 00
	$53,004 36

In the foregoing statement it will be noticed that nearly $34,000 of the money spent on "Stony Brook construction account" has been spent in and around Fresh Pond in preparing it as a suitable Storage Basin and Reservoir. In the original estimates presented to the City Council, of the cost of getting Stony Brook water nothing was named for this work around and in the Pond, which has since become a necessity in connection with the "Stony Brook scheme," and on this account the Water Board invited the City Council at different times as the work around the Pond progressed, to go upon the ground, and we showed them what we thought ought to be done, and in all cases have had their approval before going on with the work. We call attention to this now as it seems as if the original estimates would fall somewhat short of the actual expenditure on the Stony Brook scheme, and this expense around and in Fresh Pond will account for a large part of the difference between the estimates and expenditures.

No settlements have been made for water, or land damages in Waltham or Weston. Wherever we go the demand for land increases, and the price asked for it, exceeds any former experiences. Several suits have been brought under the Act and are now pending in the courts.

General Remarks.

It seems to us that one thing more ought to be done in Fresh Pond to complete it as a first class Reservoir and Settling Basin, and that is to dig out and lower the bottom of Cambridge and Boat House Nooks. The present grade of the bottom of these nooks is about 9, from the city base. At present they are bare, and from one to three feet above the water in the Pond. We cannot expect to raise the water much if any above grade 16 when the Pond is full, and we calculate that the range of the height of the water in use, after our works are complete will be between grades 13 and 16. This will give us a depth of water over these nooks of from four to seven feet. Boston and other places have had much trouble on account of shallow flowage, and they have been obliged to go to great expense to remedy this trouble. It is well settled that from seven to eight feet is as little depth of water as there ever ought to be in any Reservoir for domestic use, for the reason that in any shallow water vegetation will grow, and then when decayed will contaminate the water, and also that in shallow water different forms of algea will germinate, which have given great trouble to water works in other places, and have been the worst kind of contamination that we have had to contend with. Under these circumstances we recommend that these shallow nooks be excavated from one to three feet deeper than they now are. Early next spring seems to us to be a most favorable time to do this work. The water in the Pond is now very low and is going down every day. In connection with introducing Stony Brook water, we can keep the water down in the Pond until the work if begun, is finished, and our Reservoir would then be properly finished, and all we could wish it to be. If this work is not done now, we shall never have another such opportunity to do it to advantage, and we think in the near future the fact that it was not done will be much regretted. The expense will be considerable, but the ultimate advantage will far outweigh the expense.

In connection with this work the shore line in front of the Tudor ice houses, could be conveniently graded, and made to correspond with the border around all the rest of the Pond, and the other material taken out could be used on land owned by the city near by that needs grading up, and deposited on low lands in the immediate vicinity which the owners would be glad to have filled up which would be an indirect benefit to us. If this was done it would furnish work for a large number of Cambridge men and teams at a time of year when work is scarce and much needed. No doubt the work could be done then at a reasonable price.

The surroundings of Fresh Pond are for the most part pleasant and attractive. In the year to come the low lands around the Pond which are below high-water mark, should be filled up and graded. When this is done, and Fresh Pond Drive or Avenue is made as contemplated in our purchases, and partly laid out, Cambridge will not only have one of the finest reservoirs, but also one of the most beautiful and attractive water parks and pleasure drives to be found in the country.

Financial Condition.

Two years ago when the question of accepting the Stony Brook account was up for discussion, some doubts were felt as to whether the Water Works could carry the additional debt it would create, and continue to pay its own way as it had done heretofore. We believed that it could be done, even if the expense should exceed the estimates made at the beginning of the work. The experience of the past two years has confirmed us in our views then expressed. The growth of the city and the increased demand for water, and the consequent increase of the income from water-rates, has exceeded our calculations then made. If the water-rates are left unchanged for a few years until the works are complete, we think the Water Works will pay its current expenses, the interest on its debt, and through its Sinking Fund pay the principal of the Water Bonds when due.

Work to be Done.

The work to be done the ensuing year and for which we shall in due time ask for appropriations will be:—

First. To enable us to excavate some portions of Fresh Pond to a lower grade as herein fully set forth, and finish out the embankment around the Pond, and riprap the same.

Second. To make some needed repairs in the wall of our Reservoir, and build a small chronograph house near the stand pipe for nightly observations of the consumption of water in connection with the detection of leaks and waste of water.

Third. For general construction account.

Fourth. For maintenance account.

Fifth. For supply account.

During the coming year our Distributing Reservoirs will have to be emptied and cleaned out.

For further particulars and details in regard to what has been done the past year, and the present condition of the works, the property on hand and other matters, we would refer you to the Reports of our Superintendent and Registrar, made to this Board, which we herewith submit as part of our Report, and we also submit the reports of the Committee on Accounts, the Treasurer and Auditor.

As we draw our Report to a close, we wish to tender our thanks to the City Council for their confidence and ready coöperation in all our work, they seeming to realize with us that what we are doing is a wise and well directed expenditure of money, not only to supply our present needs, but also to provide for those who will come after us. It is our ambition to finish the work now nearing completion, so well that even if our names are forgotten, our works will remain as a lasting monument to our foresight, and devotion to the best interests of the city.

All the different departments of the Water Works in their administration, continue in good condition and working order. The regular officers and employés have been faithful in the discharge of their duties. The work at Fresh Pond has required and received the personal attention and constant supervision of our Superintendent; his former business made him well adapted to carry on that work, and when done, will itself speak to his praise.

Our Registrar has the work in his office well in hand, and he keeps all matters connected with the Water Works that come under his eye so arranged, that he can readily give any desired information pertaining to his department.

We have always received from the City Engineer, and the assistant in his office, all the help we have asked, that it was in their power to render, aud we cheerfully testify to their courtesy and prompt response to our calls.

C. W. KINGSLEY,
L. M. HANNUM,
JAS. M. W. HALL,
K. S. CHAFFEE,
JOHN F. O'BRIEN,
} *Water Board.*

REPORT

OF

THE WATER REGISTRAR.

WATER REGISTRAR'S OFFICE,
CAMBRIDGE, Dec. 10, 1886.

To the Cambridge Water Board:—

IN compliance with the requirement of the City Ordinance, I present the twenty-second annual report of the operations of this department, showing the receipts, expenditures, and abatements, together with a statement of the number of water-takers, fixtures, etc., for the year ending Nov. 30. 1886.

Amount of bills remaining unpaid Nov. 30, 1885:—

Water-rates	$78 29	
Meter-rates	849 40	
Supplies and repairs	700 10	
	$1,127 79	

Amount of bills placed in hands of City Treasurer for collection from Nov. 30, 1885 to Nov. 30, 1886:—

Water-rates	$163,924 47	
Meter-rates	39,549 50	
Supplies and repairs	7,975 05	
Off and on water, seals and fines	424 90	
Total bills		$213,001 71

There have been collected:—

Water-rates	$200,600 13	
Off and on, seals and fines	424 90	
Supplies and repairs	7,273 43	
Total collections	$208,298 46	

There have been abated:—

Water-rates	$2,977 43	
Amounts carried forward	$211,275 89	$213,001 71

Amounts brought forward		$211,275 89	$213,001 71
Supplies and repairs		20 94	
There remain unpaid:—			
Water-rates	$65 90		
Meter-rates	258 20		
Supplies and repairs	1,380 78		
		$1,704 88	
		$313,001 71	$213,001 71

Expenditures.

Construction account (Stony Brook)		$122,652 42	
Construction account (Fresh Pond Land purchase)		64,729 80	
Construction account (general)		19,282 68	
Maintenance account viz:—			
Care and repairs	$15,673 41		
Pumping service	10,737 08		
New pumping service (salaries, coal, etc.)	211 44		
Office expenses	3,236 40		
		$29,858 33	
Supply and repair account		5,943 62	
Total			$242,466 85

Abatements.

Water-rate bills to the amount of	$2,977 43	
Supply and repair bills to the amount of	20 94	
Total		$2,998 37

Refunds.

Water-rates have been refunded to the amount of	$1,195 70
Which amount deducted from receipts	200,600 13
Leaves net receipts for water	$199,404 43
Add off and on, seals and fines	424 90
Makes net receipts of rates, fines, etc.	$199,829 33

Off and On.

Water has been shut off for non-payment of rates, or per order on account of vacancy, and seals have been applied to fixtures by request of owners or occupants, as follows:—

Supplies shut off in 1886	416
Supplies let on, shut off in 1886	325
Supplies let on, shut off in previous years	50
New supplies let on	342
Seal-locks applied to fixtures in 1886	385
Seal-locks removed, put on in 1886	154
Seal-locks removed, put on in previous years	115

Statement of the yearly revenue received from water-rates since the purchase of the Works by the city:—

From	April	28, 1865	to	Dec. 1, 1865	$32,367	19
“	Dec.	1, 1865,	“	1, 1866	40,073	27
“	“	1, 1866,	“	1, 1867	52,733	62
“	“	1, 1867,	“	1, 1868	63,747	42
“	“	1, 1868,	“	1, 1869	76,149	30
“	“	1, 1869.	“	1, 1870	92,606	95
“	“	1, 1870,	“	1, 1871	111,782	65
“	“	1. 1871,	“	1, 1872	127,201	30
“	“	1, 1872,	“	1, 1873	146,117	32
“	“	1, 1873,	“	1, 1874	153,634	27
“	“	1, 1874,	“	1, 1875	138,880	37
“	“	1, 1875,	“	1, 1876	179,166	76
“	“	1, 1876,	“	1, 1877	154,843	59
“	“	1, 1877,	“	1, 1878	157,443	91
“	“	1, 1878,	“	1, 1879	164,681	90
“	“	1, 1879,	“	1, 1880	173,325	49
“	“	1, 1880,	“	1, 1881	170,062	73
“	“	1, 1881,	“	1, 1882	177,430	80
“	“	1, 1882,	“	1, 1883	179,361	89
“	“	1, 1883,	“	1, 1884 (10 months)	161,526	27
“	“	1, 1884,	“	1, 1885	185,544	36
“	“	1, 1885,	“	1, 1886	199,404	43

Comparative Statement.

	1885.		1886.	
Construction Acc't (Stony Brook.)				
RECEIVED.				
From bonds issued (par value)	$288,000 00		$125,000 00	
From premium on bonds	19,550 40		322 50	
Commonwealth of Mass	15 73			
Sale of wood at Roberts Basin			78 75	
Balance of Appropriation		$307,566 13	15,443 63	$140,844 88
EXPENDED.				
Sundry bills	$292,122 50		$122,652 42	
Balance of bonds issued	15,443 63	$307,566 13	18,192 46	$140,844 88
Construction Acc't. (Fresh Pond Pond Land Purchase.)				
RECEIVED.				
From bonds issued (par value)			$90,000 00	
Sale of old material			2,750 00	$92,750 00
EXPENDED.				
Purchase of sundry estates, examination of titles, etc			$64,729 80	
Balance of appropriation			28,020 20	92,750 00
Construction Acc't. (General.)				
RECEIVED.				
From bonds issued (par value)			$18,000 00	
From premium on bonds			232 20	
Refund of overcharge			1 50	
From excess of receipts from rates, fines, etc		$12,434 32	1,048 98	$19,282 68
EXPENDED.				
Sundry bills		$12,434 32		$19,282 68
Maintenance Account.				
RECEIVED.				
Accrued interest on Water Bonds			$135 90	
Rates, fines, etc		$185,991 86	199,829 33	$199,965 23
EXPENDED.				
Care and repairs	$29,914 51		$29,858 33	
Interest on Water debt	92,725 00		99,015 00	
Paid to Sinking Fund Commissioners	52,425 00	$175,064 51	57,675 00	$186,548 33
Excess of receipts		$10,927 35		$13,416 90
Supply Account.				
Received		$6,250 55		$7,273 43
Expended		4,491 97		5,943 63
Excess of receipts		$1,758 58		$1,329 81

1885. Maintenance Account, excess of receipts	$10,927 35
Supply account, excess of receipts	1,758 58
Excess of total receipts over expenditures	$12,658 93
Expended on Construction Account, (general)	12,434 32
Balance due Sinking Fund	$251 61
1886. Maintenance Account, excess of receipts	$13,416 90
Supply Account, excess of total receipts	1,329 81
Excess of total receipts over total expenditures	$14,746 71
Expended on Construction Account (general)	1,048 98
Balance due Sinking Fund	$13,697 73

The excess of receipts for 1886, as shown in the above comparative statement, amounting to $13,697.73, has been carried to the Sinking Fund, as required by law.

Beside the manufactories, etc., supplied by meter, water is now supplied to 13,414 families, 853 stables, with 2,338 horses, and 237 cows, 234 shops, 412 stores and offices, by the following fixtures, viz :—

16,363 faucets.
4,297 wash-basins.
2,920 wash-tubs.
2,415 bath-tubs.
6,831 pan-closets.
856 slop-closets.
17 hopper-closets.
95 urinals.
46 yard hydrants.
5 fountains.
3 tumbler-washers.
1,209 hand-hose.

Also,

612 fire-hydrants (besides 4 on private premises).
13 fire reservoirs.
16 drinking-fountains in public squares.

The above is exclusive of the school-houses, engine-houses police-stations and other city buildings, for which special rates are charged, except where meters are located.

The usual house to house inspection has been made during the year, and from this inspection, aided by reports from plumbers, a considerable amount of water-rates has been added and collected for fractional parts of the year.

Respectfully submitted,

WALTER H. HARDING,

Registrar.

REPORT

OF THE

COMMITTEE ON ACCOUNTS OF THE CAMBRIDGE WATER BOARD.

We have examined the abstract of accounts as presented to us by the Water Registrar, covering the records of the past year. We have compared it with the statements submitted to us the City Treasurer and Auditor, and we find them to be correct and in agreement. Annexed is the financial statement, in brief, presented to us by the Water Registrar, and verified by us: —

Amount of bills in hands of City Treasurer, Nov. 30, 1885: —			
For water-rates		$427 69	
For supplies and repairs		700 10	$1,127 79
Amount of bills delivered to the City Treasurer for collection during the year ending Nov. 30, 1886: —			
For water-rates		$163,924 47	
For meter-rates		39,549 50	
For supplies and repairs		7,975 05	
For off and on, seals and fines		424 90	$211,873 92
Total bills			$213,001 71
Of these amounts the Treasurer reports as collected		$211,296 83	
Less refunded	1,195 70		
Less abated	2,998 37		
		$4,194 07	
Total net collections		$207,102 76	
Add refunded and abated, as above		4,194 07	
Balance uncollected, Nov. 30, 1886		1,704 88	
			$213,001 71

We would suggest that the present system of keeping the water accounts be so modified that the Treasurer, if it be found practicable by the Finance Committee, shall receipt to the Registrar for all bills sent to him (the Treasurer) for collection.

JAS. M. W. HALL,
WM. E. RUSSELL,
JOHN H. CORCORAN,
Committee on Accounts.

CAMBRIDGE, Dec. 1, 1886.

CITY OF CAMBRIDGE,
OFFICE OF CITY TREASURER,
December 17, 1886.

To the Committee on Accounts of Cambridge Water Works: —

There has been collected during the year ending Nov. 30, 1886, for account of water works, rates, fines, &c.		$204,002 46
And during the same time for supply account		7,294 37
		$211 296 83
There has been paid by the City Treasurer for account of abatements on water bills	$2,998 37	
And for refunds on water account	1,195 70	
		$4,194 07
Leaving net collections for both accounts		$207,102 76
The uncollected water bills in my hands are		324 10
The uncollected supply account bills in my hands are		1,380 78

Respectfully,

WM. W. DALLINGER,
City Treasurer.

CITY OF CAMBRIDGE,
December 1, 1886.

STATEMENT TAKEN FROM THE AUDITOR'S LEDGER.

WATER WORKS, (RATES, FINES, ETC.)

Amount of uncollected bills in Treasurer's hands Dec. 1, 1885	$427 69
Amount of bills placed in Treasurer's hands to Dec. 1, 1886,	203,898 87
Total	$204,326 56
Amount collected by City Treasurer to Dec. 1, 1886	204,002 46
By balance uncollected Dec. 1, 1886	$324 10

Abatements	$2,977 43
Refunds	1,195 70

WATER WORKS (SUPPLIES).

Amount of uncollected bills in City Treasurer's hands Dec. 1, 1885		$700 10
Amount of bills placed in City Treasurer's hands to Dec. 1, 1886		7,975 05
Total		$8,675 15
Amount collected by City Treasurer to Dec. 1, 1886		7,294 37
Balance uncollected Dec. 1, 1886		1,380 78
Abatements	20 94	

HARRY T. UPHAM,

Auditor of Accounts.

ANNUAL STATEMENT OF THE WATER REGISTRAR TO THE COMMITTEE ON ACCOUNTS, DECEMBER 1, 1886.

Water-rates unpaid Nov. 30, 1885		$427 69	
Bills placed in hands of City Treasurer, for collection from Dec. 1, 1885, to Dec. 1, 1886:			
Water-rates from annual ledger	$149,381 35		
Water-rates from fractional ledger	14,543 12		
Water-rates from meter ledger	39,549 50		
Off and on water	344 65		
Seals	80 25		
		203,898 87	
Total bills on rates, fines, etc.		204,326 56	
Supply and repair bills unpaid Nov. 30, 1885	700 10		
Supply and repair bills placed in hands of City Treasurer for collection from Nov. 30, 1885, to Nov. 30, 1886	7,975 05		
		8,675 15	
Total bills			213,001 71
There has been collected, annual ledger	147,815 14		
There has been collected, meter ledger	39,628 70		
Amount carried forward	187,443 84		

Amount brought forward . .	187,443 84		
There has been collected, fractional ledger	13,156 29		
There has been collected, off and on, and fines	344 65		
There has been collected, seals . .	80 25		
Total collections on rates, fines, acc't. . .		201,025 03	
Collections on supply and repair accounts . .		7,273 43	
Total collections . .		208,298 46	
There have been abated, water rates	$2,977 43		
There have been abated, supplies and repairs	20 94	$2,998 37	
There remain uncollected, water rates	324 10		
There remain uncollected, supplies and repairs	1,380 78	1,704 88	213,001 71
Total collections.	$208,298 46		
Less refunds	1,195 70		
Total net receipts.		$207,102 76	

Attest: WALTER H. HARDING,
Registrar.

REPORT

OF THE

SUPERINTENDENT OF THE WATER WORKS.

CAMBRIDGE, Nov. 30, 1886.

To the President and Members of the Cambridge Water Board:—

GENTLEMEN:—The annual report of your Superintendent, upon the condition of the works and the operations of the past year, is herein presented.

The total amount of water pnmped was 1,235,558,878 gallons, Coal consumed per million gallons pnmped, 1,602$\frac{2}{3}$ pounds. Water sold by meter, and that used for watering streets, 317,048,175 gallons, leaving as the amount for domestic use 918,510,703 gallons. Number of gallons daily for each inhabitant on whole amount pumped, 54$\frac{6}{10}$ gallons. Number of gallons daily for each inhabitant on amonnt for domestic use, 40$\frac{59}{100}$ gallons.

Conduit, Wellington Brook, Little and Spy Ponds.

No inspection of the Conduit has been made as we are so near the time when it will cease to be used as formerly.

Water was taken from Wellington Brook, January 13, to February 20, and from the filter basin January 13 to March 31.

Little Pond gates were opened January 13th and shut on the 15th.

By request of the ice men, the small gate on Spy Pond was opened January 15, and closed on the 20th, in order to fill Little Pond to high water mark to facilitate the cutting of ice when it should freeze over.

Fresh Pond.

The city having purchased the lot of land, about five acres in area, on the east side of Fresh Pond, near the depot, upon which the large brick ice-house formerly stood, a driveway has been built to and around Fresh Pond Grove, and a roadway has been commenced at the beginning of the above road which will run parallel with the Fitchburg Railroad to Fresh Pond Lane.

Both roads will connect with the driveway already built. The remainder of the lot has been laid out, and partially graded for a Park, which, when completed, will greatly add to the appearance of that locality.

The low land on the south side of the Grove, back of where the old Boat-houses stood, has been filled to grade. All of the material on the south shore and in the vicinity of Boat House Nook, that had been carted out of the Pond in former years, was used in building the roadway around the Grove, getting rid of the unsightly material.

The driveway from Boat House Nook to Eames' Nook Dam has been widened to 30 and 40 feet. The banks of the cut leading to Holworthy Street from the south side of the Pond have been sloped and the roadway gravelled. The grading of the roadway and riprapping the slopes on the west side of the Pond between Eames and Bright's Nook Dams have been completed, also the dam across Bright's Nook has been widened to 40 feet. Gage Nook has been filled.

A dam across Black's Nook and a roadway on the north shore have been commenced and at this date are nearly completed. As the material for all the grading has been taken out of the Pond, the shore lines have been very much improved and the Pond deepened. It is a source of much satisfaction to know that Black's Nook is now cut off from the Pond. There is now a roadway, from 30 to 40 feet wide, entirely around the Pond, a distance of 2¾ miles, except where the Hittinger and Tudor ice houses now stand.

The water in Fresh Pond reached its highest point May 12, *viz* :—13.74 feet, and its lowest, Dec. 1, *viz* :—6.62 feet. The average height for the year was 10.27 feet. The water has been analyzed three different times during the year showing the result that it has maintained its usual purity.

The rainfall for the year has been 46.12 inches.

Pumping Works.

No repairs have been needed on either the engine-house or coal-shed. Four new boilers, built by Campbell & Son, have been set, two to take the place of old ones deemed unsafe to use longer, and the two extra ones to give steam capacity for running both pumps when necessary.

The auxiliary pumps were stopped January 30, and started again October 24. There are now three pumps on the borders of the Pond, two Follansbee pumps and one 12in. centrifugal.

The engine-house lot and Tudor Park have received necessary care. The apology for a fence has been patched up, but it is a question if it would not be real economy to build a new and suitable one.

Reservoirs.

Nothing has been done except to cut the grass and keep the walks graded. No change in the walls is perceptible. As noted in preceding reports, the high wall should receive attention and a chronograph house should be built. The Reservoir basins should be cleaned out the coming season.

High Service.

No extension of this service has been made. It is working perfectly and no complaint of lack of water, within the territory covered by this system, has been made.

Main Pipe.

At Stony Brook about 650 feet of pipe has been laid on the berme of the dam, connection made at the Gate-house, and the line is now complete from the Brook to Fresh Pond.

Main pipes have been laid in the following streets:—401 ft. of 4-in. in Agassiz St., 6½ ft. of 6-in. in Antrim St., 47 ft. of 2-in. in Athens Court, 160 ft. of 4-in. in Auburn St., 7 ft. of 6-in. and 396 ft. of 4-in. in Bates St., 40 ft. of 4-in. in Bath St., 243½ ft. of 4-in. in Bay St., 498 ft. of 4-in. and 13 ft. of 6-in. in Bellevue Ave., 275 ft. of 6-in. in Blake St., 24 ft. of 4-in. in Blanch St., 877½ ft. of 6-in. (renewal) and 45 ft. of ¾-in. in Blackstone St., 118 ft. of 4-in. in Brewery St., 2 ft. of 4-in. in Brookline and Auburn Sts., 251 ft. of 1½-in. in Concord Ave., 150 ft. of 6-in. in Crescent Ave., 4 ft. of 6-in. in Divinity Ave., 76 ft. of 4-in. in Donnell St., 125 ft. of 1½-in. in Essex Court, 6½ ft. of 6-in. in Fayette St., 198 ft. of 6-in. in First St., 421 ft. of 6-in. in Fifth and Bent Sts., 455 ft. of 6-in. in Garfield St., 159½ ft. of 1¼-in. and 200 ft. of 4-in. in Grigg St., 386 ft. of 4-in. in Groveland St., 119 ft. of 1½-in. in Hampshire Court, 225 ft. of 4-in. in Harrison St., 222 ft. of 4-in. in Holworthy St., 552 ft. of 6-in. in Lancaster St., 943 ft. of 6-in. in Lexington Ave., 168 ft. of 4-in. in Locke St., 101 ft. of 1½-in. in Maynard Place, 7½ ft. of 6-in. and

3 ft. of 2-in. in Maple Ave., 105 ft. of 6-in. in Montgomery St., 241 ft. of 4-in. in Moore St., 41 ft. of 4-in. in Mt. Auburn St., 726 ft. of 8-in. and 46 ft. of 6-in. in Ninth St., (renewal), 141 ft. of 4-in. in Norfolk St., 3 ft. of 6-in. in Pearl St., 44 ft. of 6-in. and 159 ft. of 4-in. in Pioneer St., 6½ ft. of 6-in. in Pleasant St., at corner of Chestnut, 74 ft. of 1½-in. in Potter Court, 116½ ft. of 1¼-in. in Court off Putnam Ave., 313 ft. of 4-in. in Railroad St., 40½ ft. of 6-in. in Raymond St., 149 ft. of 4-in. in Reidesel Ave., 620½ ft. of 8-in. and 31½ ft. of 6-in. in Rogers St., 226 ft. of 4-in. in Rutland St., 86 ft. of 6-in. in Sixth St., 30 ft. of 1¼-in. in Squire's Court, 215½ ft. of 4-in. in Surrey St., 202 ft. of 2-in. in Trowbridge Court, 159 ft. of 6-in. and 421 ft. of 4-in. in Washington Ave., 25½ ft. of 6-in. in Washington St., and 45 ft. of ¾-in. pipe has been used for blow-offs.

On Pleasant St., from Putnam Ave. to Chestnut St., the 6-in. main has been taken up and an 8-in. pipe laid in its place. This change was made solely to accommodate the Dover Stamping Co., and all cost of the change was paid by them.

New Supplies.

360 new supplies have been laid making a total of 9091. 16 old supplies have been renewed and 43 furnished with sidewalk shut-offs. Two have been enlarged.

Leakage.

515 leaks have been stopped; namely:—one on 2-in. main, two on 3-in. main, three on 4-in. main, three on 6-in. main, one on 6-in. cement main, one 20-in. cement main, forty-nine on supplies in the streets, one at meter connection, and 454 on premises reported by inspectors and repaired by owners or occupants.

All of the fixtures on premises were inspected when the annual canvass was made and inspection of the main pipes and fixtures has been carried on during the Summer.

Drinking Fountains.

One new drinking fountain has been set, on Garden Street, near the Washington Elm, making the number at this date fifteen.

Stand Pipes for Street Watering.

No change has been made, the number remaining the same as last year; namely—40.

Gates.

All of the gates have been inspected and put in good condition.

Boxes.

22 hydrant boxes, 33 gate boxes, 5 cock boxes and 16 iron boxes have been set in place of decayed ones removed. I cheerfully recommend the iron box as superior in every way.

Hydrants.

Twenty new Chapman hydrants have been set during the year, and nine flush hydrants have been removed, making the total number now in use 612.

The flush hydrants removed were located as follows: Washington Ave., Washington and Main Sts., Ninth and Spring Sts., Ninth and Otis Sts., Pleasant and Chestnut Sts., Maple Ave. Fayette St., Antrim St., and Divinity Ave.

There are five flush hydrants on private premises *viz* :—two, on premises of New England Glass Co. on North St., two on premises of Boston & Lowell Railroad Co., on Prison Point St., and one on premises of C. L. Jones & Co. on Pearl St.

Five street reservoirs have been discontinued *viz* :—junction of Bow and Arrow Sts., Boylston St., corner of Eliot, Webster Ave., corner of Cambridge St., Norfolk St., midway between Hampshire St. and Broadway, and at North Ave., near Russell St. The number now in use is eight.

Brookline Street Pipe Bridge.

The sheathing has needed repairing it having been damaged by ice. I recommend that the west side be lined with two-inch plank from the bottom up three feet, as the present sheathing is not strong enough to resist the pressure of the ice at high tides. The siphon has been pumped out.

Pipe Yard.

A strip of land, 100 feet on Auburn St., and 100 feet deep, has been added to the yard. The dwelling house has been shingled and painted and slight interior repairs have been made.

The following tables show the locations of meters, fountains and stand pipes, the details of main and supply extention, and the account of stock on hand.

List of Meters in Use November 30, 1886.

Meters.	Locality.	Size.	Description.
Alghieri, Simon	Main st	¾	Worthington
Andrews, D. H.....)	Sixth st	1	Worthington
American Steam Laundry	Osborn st	1	Crown
“ Net & Twine Co	Third st	1½	Worthington
“ Rubber Co	Potter st	4	Crown
“ “ “	Potter st	6	Gem
“ Steam Safe Co	Main st	1	Worthington
Aquinas Hall	Harvard st	1	Worthington
Barbour, W. O.	Osborn st	1	Worthington
“ “ “	Osborn st	¾	Desper
Blake, I. W	Church st	1	Worthington
“ “ “	Palmer st	¾	Ball & Fitts
Bay State Brick Co	Spruce st	¾	Worthington
Barnes F. G. (Felton Hall)	Cambridge st	1½	Worthington
Balcom, A. W.	Austin st	¾	Union
Berry, Casper	Elm st	1	Crown
Bird, H. M.	Broadway	⅝	Union
Bullock, O. L.	Broadway	¾	Worthington
Burton, A. & E.	Harvard st	¾	Worthington
Boston Woven Hose Co	Hampshire st	4	Worthington
Boston Stamping Co	Third st	1½	Union
B. & L. R. R. (Repair shop)	Bridge st	2	Worthington
“ “ “ (Round-house)	Prison Point st	2	Worthington
“ “ “ (Round house)	Prison Point st	2	Worthington
“ “ “ (Paint shop)	Prison Point st	1	Worthington
“ “ “ (Car-house)	Prison Point st	2	Worthington
“ “ “ (Filling locom)	Prison Point st	6	Union
Carr Bros	Lopez st	1	Worthington
Cambridgeport Diary Co	Magazine st	1	Worthington
Cambridge Electric Light Co	Main st	1½	Union
Cambridge Gas Light Co	Third st	1½	Crown
Cambridge Gas Light Co	Ash st	¾	Worthington
Cambridge Hospital	Mt. Auburn st	1½	Crown
Campbell Bros	Main st	¾	Crown
Charles River R. R. Co	Hampshire st	¾	Worthington
“ “ “	Green st	¾	Worthington
“ “ “	Brookline st	1	Worthington
City of Cambridge (Shepard sch.)	North av	2	Worthington
“ “ (Ward 1 Bld.)	Brattle sq	1½	Worthington
“ “ (Ward 4 Bld.)	Central sq	1½	Worthington
“ “ (Upton sch.)	Upton st	2	Worthington
“ “ (Cemetery)	Coolidge av	4	Worthington
“ “ (Almshouse)	Tannery st	2	Worthington
Cambridge R. R. Co. (Paint shop)	Dunster st	¾	Worthington
“ “ (Repair shop)	Dunster st	¾	Worthington
“ “ (Car-house)	Dunster st	⅝	Desper
“ “ (Wood stable)	Dunster st	¾	Worthington
“ “ (Brick stable)	Dunster st	1	Worthington
“ “ (Office)	Harvard sq	¾	Crown
“ “ (Washing cars)	Murray st	1½	Crown
“ “ (Stable)	Murray st	1½	Worthington
“ “ (Car-house)	Cambridge and Baldwin	1	Desper
“ “ (Stable)	Baldwin st	1	Worthington
“ “ (Brick stable)	Cambridge st	1	Worthington
“ “ (Stable)	Cambridge st	1	Worthington
“ “ (Stable)	Cambridge st	1	Worthington
“ “ (Stable)	Mt. Auburn st	2	Crown
“ “ (Stable)	North av	2	Worthington
“ “ (Stable)	Main st	2	Worthington
“ “ (Stable)	River st	1	Worthington
Cambridge Y. M. C. A	Main st	2	Worthington
Cushman Bros	Main st	¾	Union
Close, George	Broadway	1	Worthington
Caswell & Coolidge	Franklin st	1	Worthington
Coleman, John & Son	Broadway	1	Worthington
Clark, B. P. & Co	Main st	1½	Worthington
Cochrane & Co	Potter st	1	Crown
Childs & Co	Main and Osborn sts	¾	Union
Cass, F.	Auburn st	4	Crown
Cofran, L. M	Concord av	2	Worthington
Coolidge, J. G. (Green house)	Coolidge av	1	Worthington
“ “ “ (Barn)	Coolidge av	2	“
Davis, Curtis & Co	Broadway	2	Worthington
Davis, J. C. & Co	Broadway	2	Crown

List of Meters (Continued).

Meters.	Locality.	Size.	Description.
Dugan & Rutherford	First st	1	Crown
Daniels Badger & Co	First st	¾	Union
Daniels Badger & Co	Albany st	2	Crown
Davenport, A. H	Cambridge st	2	Worthington
" " "	Otis st	¾	Crown
Dailey C. W	Cambridge st	1	Worthington
Derby, H	Main st	1	Crown
Dover Stamping Co	Putnam av	6	Union
Downing, Theo	Eustis Ct	1	Worthington
Draper, Francis & Co	Otis st	¾	"
Docker & Holton	Broadway	2	"
Dow, Davis & Co	Portland st	2	Crown
Day, Cordage & Co	Rogers st	2	"
Dee, T. W	Brattle st	1	"
De Rosay, L. E. & Sons	Dublin st	¾	Worthington
East Cambridge Club Stable	First st	1	"
Episcopal Seminary	Brattle st	1½	"
Furfey, James	Brookline st	¾	"
Fischer, F	Tannery st	2	Union
Gilmore & Eustis	Portland st	2	Worthington
Goepper Bros	Ninth st	1½	"
" "	Ninth and Spring sts	2	"
Greely, Leander	Broadway	1½	"
Griffin & Dolan	Decatur st	⅝	Crown
Harvard College (Holworthy Hall)	College grounds	¾	Worthington
" " (Boylston Hall)	" "	2	Crown
" " (Stoughton Hall)	" "	¾	Worthington
" " (Sever Hall)	" "	¾	Crown
" " (Thayer Hall)	Cambridge st	1½	Worthington
" " (In yard)	College grounds	1½	Worthington
" " (Memorial Hall)	Cambridge st	2	"
" " (Boat house)	De Wolfe st	¾	Desper
" " (BotanicGarden)	Garden st	1	Crown
" " (Gymnasium)	Cambridge st	1½	"
" " (Holyoke house)	Harvard st	2	Worthington
" " (Museum)	Divinity av	1	"
" " (Scientific school)	Kirkland st	¾	"
" " (Law school)	Holmes Place	1½	"
" " (Laboratory)	Holmes Place	1	"
" " (Jarvis field)	Everett st	¾	"
" " (Holmes field)	North av	2	Union
Hawley Machine Co	First st	1	Worthington
Hilton, J. M	Harvard st	1½	"
Hazlett & Underhill	First st	1½	"
Hews, A. H. & Co	Richdale av	1	"
Holt & Bugbee	East st	1½	Union
Hixon, Edward & Co	Main st	1	Ball and Fitts
Hovey & Co	Cambridge st	1	Worthington
Houghton, H. O. & Co	Blackstone st	6	Union
" " "	" "	⅝	Crown
" " "	" "	2	Worthington
Howe & Putney	Distillhouse st	1	"
Howland, W. B	Linden st	⅝	Crown
Hopkins, J. H. T	Prospect st	¾	Worthington
Ivers & Pond (Factory No. 1)	Main and Albany st	2	"
" " (Factory No. 2)	" " "	2	Crown
Instantaneous Photo. Co	Main st,	1	"
Johnson & Doane	Green st	¾	Worthington
Jones, C. L. & Co	Pearl st	¾	"
Kemp, L. & Sons	Davis st	1	"
Kennedy, F. A. & Co	Green st	1½	"
" " "	Main st	¾	Crown
" " "	Franklin st	1½	Union
Kendall & Roberts (Engine room)	Main st	¾	Worthington
" " (Boiler shop)	" "	¾	"
" " (Foundry)	" "	¾	"
Low, J. W	Reed st	1½	"
Little, Brown & Co	Blackstone st	1	Ball and Fitts
Lamb & Ritchie	Albany st	1	Union
Latin school	Lee st	1	Worthington
Mason & Hamlin	Broadway	1½	Crown
Middlesex Bleachery	Sacramento st	1	Worthington
Middlesex Co. (Court house)	Otis st	¾	"
" " (Registry of Deeds)	Otis st	¾	"
" " (H of Correction)	Thorndike st	4	Union

List of Meters (Continued).

Meters.	Locality.	Size.	Description.
Middlesex Co. (Court house)	Thorndike st	¾	Union.
Millan, Alex	Brattle sq	¾	Crown
Moore, Chas	Farwell Pl	1	Worthington
Meering, Mrs. A. L. (Beck Hall	Main st	1	"
Murdock, W. H	Grigg st	⅝	Desper
Mt. Auburn (Greenhouse)	Brattle st	1	Worthington
" " (Cemetery)	Mt. Auburn st	⅝	Desper
Maverick Oil Co	Sixth st	2	Worthington
Miller & Shaw	Broadway	1	"
Morrill & Allen	Main st	¾	Crown
New England Glass Works	North st	2	Union
" " " "	North st	2	Worthington
North C. H. & Co	Columbia st	2	"
Norton, E. H	Winsor st	1	"
O'Brien, John F	Coolidge av	¾	"
Page, Geo G., Box Co	Hampshire st	2	"
Parry Bros. & Co	Raymond st	¾	"
Patterson, R. J	Cedar st	2	Union
Pray & Mayall	Third st	2	Crown
Porcellian Club	Harvard st	1	"
Porter's Hotel	North av	¾	Worthington
Phillips, Geo. L.	Main st	¾	"
Ross, Mrs. H. P.	Broadway	¾	"
Reardon, John & Sons	Waverley st	4	"
Revere Sugar Ref. (South side)	Water st	3	"
" " " (North side)	Water st	3	Union
Reversible Collar Co	Mt. Auburn st	1	Worthington
Rawson & Morrison	Main st	¾	"
Rougher, M	B. & L. R. R. Yard	2	Union
Rideout, M. E	State st	1	Worthington
Roberts, O. P	Brattle sq	1	"
Ross, A. M.	Main st	¾	"
Rogers, Geo. M	Washington st	3	"
Russell, & Zerega	State st	¾	"
Schenk (Laundry)	Main st	¾	Crown
Sargent, Dr. D A	Palmer st	1	Ball and Fitts
Sands, M. W	Walden st	1	Worthington
" " "	Dublin st	¾	Union
" " "	Dublin st	¾	"
Shorey, Geo. L	Kinnaird st	4	"
Smart, D. C	Main st	2	Worthington
Saurman, B. F	Gore st	¾	Desper
Sortwell, D. R. & Co	Distillhouse st	2	Worthington
St. Mary's Church	Norfolk st	2	"
" " (Gymnasium	Harvard and Prospect st	¾	"
" " (Orphan Asylum)	Cambridge and Elm	1	"
Spears, Gregory & Co	Rogers st	1½	"
Slavens J. W. L	Bridge st	1	Crown
Squire, J, P. & Co	Gore st	1	Worthington
" " " (Stable)	Gore st	2	"
" " "	Gore st	4	"
" " "	Gore st	6	Gem
Schaeffer Eletric Light Co	Main and Osborn sts	¾	Union
Sweetzer Bros	Otis st	¾	Worthington
Tower, Sylvester	Broadway	2	"
" "	Broadway	1	"
Thurston & Hall	Elm st	1	"
Tug, "Henry Chapel,"	First st	2	Crown
Teele, Frank H	Lincoln Ct	¾	Worthington
Thayer, Henry & Co	Broadway	2	"
Tracy, M. F	Boylston st	1	Desper
Temple F. L	Kirkland st	2	Worthington
Union Pacific Tea Co	Main st	¾	Union
Uhrig, Joseph	Main st	1½	Worthington
Union Glass Co (Packing room)	Webster av	⅝	Crown
" " " (Pot room)	Webster av	1	Worthington
Varnum, W. H	Putnam av	¾	"
Whitney, W. H	Main st	¾	Crown
Wilson, John & Son	Brattle st	1	Worthington
Woodbridge, S. F	Frank st	1	"
Waitt & Watts	Otis st	1	"
Wright & Scorgie	Mt. Auburn st	¾	Desper
Wilkins, Wm	Earl st	1	Crown
Woodbury, J. A	First st	2	Union

Accompanying this report is that of the Engineer at the Pumping Station, with a full account of the operations at the Engine-house.

Respectfully submitted,

HIRAM NEVONS,

Superintendent.

List of Drinking-Fountains, Nov. 30, 1886.

Bridge Street, junction of Cambridge Street.
Broadway, corner of Norfolk Street.
Brattle Square, east side at Brewer's Block.
Brattle Street, junction of Fresh Pond Lane.
Central Square, west side.
Central Square, east side.
Garden Street, at Washington Elm.
Hampshire Street, junction of Broadway.
Harvard Square, at the flag-staff.
Inman Square, east side.
Main Street, junction of Broadway.
Main Street, junction of Mt. Auburn Street.
North Avenue, corner Walden Street.
North Avenue, north side, west of Cameron Street.
Putnam Avenue, corner Brookline Street.

List of Stand-Pipes for Street Watering, Nov. 30, 1886.

Brattle Street, near University Press.
Brattle Street, corner Sparks Street.
Brattle Street, near Fayerweather Street.
Brattle Street, near Fresh Pond Lane.
Bridge Street, junction of Cambridge Street.
Broadway, near Third Street.
Broadway, corner Sixth Street.
Broadway, corner Windsor Street.
Broadway, junction of Hampshire Street.
Brookline Street, corner of Putnam Avenue.
Cambridge Street, near Warren Street.
Cambridge Street, near Windsor Street.
Cambridge Street, at Inman Square.
Columbia Street, near Austin Street.
Concord Avenue, near Wyeth Street.
Dana Street, corner of Chatham Street.
Gore Street, west of Third Street.
Green Street, near Western Avenue.
Garden Street, near Chauncey Street.
Harvard Street, corner of Prescott Street.
Inman Street, near Broadway.

Kirkland Street, near Quincy Street.
Main Street, near Portland Street.
Main Street, near Hancock Street.
Magazine Street, opposite Warland Street.
Mt. Auburn street, near Athens Street.
North Avenue, near Common.
North Avenue, corner Sacramento Street.
North Avenue, near Roseland Street.
North Avenue, near Beech Street.
North Avenue, near Spruce Street.
North Avenue, corner Norris Street.
North Avenue, opposite Tannery Street.
Prison Point Street, opposite Round-house.
River Street, near Putnam Avenue.
Sixth Street, near Thorndike Street.
Spruce Street, corner Cedar Street.
Third Street, near Rogers Street.
Thorndike Street, near Third Street.
Western Avenue, corner Howard Street.

Main Pipe Laid, Number of Gates and Fire Hydrants.

Locations.	Iron Pipe.		Gates.		Hydrants.	
	Length.	Size.	No.	Size.	No.	Size.
	Feet.	Inch.		Inch.		Inch.
Agassiz street	401	4	2	4	....	....
Antrim street	6½	6	....	....	1	6
Athens court	47	2	1	2	....	....
Auburn street	160	4	....	....	....	....
Bates street	7	6	....	...	1	6
Bates street	396	4	2	4	....	....
Bath street	40	4	....	....	....	....
Bay street	243½	4	1	4	....	....
Bay street	..	..	1	6	....	....
Bellevue avenue	498	4	1	4	....	....
Bellevue avenue	13	6	....	....	1	6
Blake street	275	6	....	....	....	....
Blackstone street	877½	6	1	6	....	....
Blackstone street	45	¾	1	4	....	....
Brewery street	118	4	1	4	....	....
Brookline and Auburn	2	4	1	4	....	....
Blanche street	24	4	....	....	....	....
Concord avenue	251	1½	1	1½	....	....
Crescent avenue	150	6	....	....	....	....
Divinity avenue	4	6	....	....	....	....
Donnell avenue	76	4	....	....	1	6
Essex court	125	1½	1	1½	....	....
Fayette street	6½	6	....	....	1	6
First street	198	6	....	....	1	6
Fifth and Bent streets	421	6	1	6	1	6
Garfield street	455	6	....	....	1	6
Grigg street	159½	1½	....	....	....	....
Grigg street	200	4	1	4	....	....
Groveland street	386	4	1	4	....	....
Hampshire court	119	1½	1	1½	....	....
Harrison street	225	4	2	4	....	....
Holworthy street	222	4	1	4	....	....
Lancaster street	552	6	1	6	1	6
Lexington avenue	943	6	1	6	1	6
Locke street	168	4	....	....	....	....
Maynard place	101	1½	....	....	....	....
Maple avenue	7½	6	....	....	1	6
Maple avenue	3	2	1	2	....	....
Montgomery street	105	6	....	....	....	....
Moore street	241	4	2	4	....	....
Moore street	..	..	1	6	....	....
Mt. Auburn street	41	4	....	....	....	....
Ninth street	726	8	1	8	....	....
Ninth street	46	6	1	6	3	6
Norfolk street	141	4	1	4	....	....
Pearl street	3	6	1	6	....	....
Pearl street	..	..	1	4	....	....
Pioneer street	44	6	1	6	....	....
Pioneer street	159	4	....	....	....	....
Pleasant cor. Chestnut street	6½	6	....	....	1	6
Potter court	74	1½	1	1½	....	....
Putnam avenue, off Court	116½	1½	1	1½	....	....
Railroad street	313	4	....	....	....	....
Raymond street	40½	6	....	....	....	....
Reidesel avenue	149	4	....	....	....	....
Remington street	..	..	1	3	....	....
Rogers and Fifth streets	31½	6	1	6	1	6
Rogers and Fifth streets	620½	8	1	8	....	....
Rogers and Third streets	..	..	....	....	1	6
Rutland street	226	4	1	4	....	....
Sixth street	86	6	....	....	....	....
Squire's court	30	1½	....	....	....	....
Surrey street	215½	4	1	4	....	....
Trowbridge court	202	2	1	2	....	....
Washington avenue	165½	6	1	6	2	6
Washington avenue	421	4	1	4	....	....
Washington street	19	6	....	....	1	6

Recapitulation.

	8 Inch.	6 Inch.	4 Inch.	3 Inch.	2 Inch.	1½ Inch.	1¼ Inch.	¾ Inch.	Total.
Length in feet of iron pipe..	1,346½	4,463	5,066	....	252	715	306	45	12,193½
Number of gates............	2	11	21	1	3	4	1	....	43
Number of hydrants.........	....	20	....	....	....	....	....	....	20

New Supplies.

GALVANIZED PIPE AND BRASS FITTINGS USED FROM DEC. 1, 1885, TO DEC. 1, 1886.

	8 Inch.	6 Inch.	4 Inch.	3 Inch.	2 Inch.	1½ Inch.	1¼ Inch.	1 Inch.	¾ Inch.	Total.
Length in feet of pipe laid..................	341	590	422½	7	1,728	405	628	1,169	10,777	16,067½
Number of supplies......	1	3	6	..	12	4	15	28	291	360
No. of stop and wastes..	..	..	..	..	10	4	15	29	289	347
Number of screw cocks.	..	..	..	..	8	4	14	29	287	342
No. of sidewalk cocks...	..	..	..	..	..	1	1	29	289	320
Number of stand pipes..	..	..	..	..	..	1	2	29	285	317
Number of boxes, frames and covers...............	..	..	..	..	..	..	..	..	..	45

List of Check-Valves.

OLD HIGH-SERVICE.

	Size in inches.
Lake View Avenue, 150 feet north from Huron Street............	10
Lake View Avenue, 150 feet north from Brattle Street...........	6
Fayerweather and Reservoir Streets..............................	6
Concord avenue, 185 feet south from Buckingham street..........	6
Buckingham street, 220 feet west from Concord avenue..........	6
Garden and Linnæan streets..	6
Raymond and Linnæan streets......................................	6
Avon Hill and Linnæan streets.....................................	6
Arlington street, 230 feet west of North avenue..................	6
Mt. Vernon street, 100 feet west from North avenue.............	6
Mt. Pleasant street, 150 feet south from Walden street...........	6

List of Check-Valves.—Continued.

NEW HIGH-SERVICE.

	Size in inches.
Highland street, on old 12-inch supply main	12
Dana street and Broadway	4
Harvard street, near Hancock	6
Centre street, near Hancock	4
Dana street, near Main	4
Harvard and Ellery streets, two valves	6
Harvard and Trowbridge streets, two valves	4
Harvard and Ware streets	4
Harvard and Prescott streets	4
Quincy street, near Broadway	4
Broadway, on line of 6-inch pipe crossing College Grounds	6
Waterhouse street, near small common	6
Kirkland and Cambridge streets	10
Berkeley street, near Craigie	4
Appian Way, near Brattle street	4
Linnæan and Lancaster streets (old high-service extension)	6
Kirkland street and Frisbie place	4

Statement of Stock on Hand Dec. 1, 1886.

FOR STREET MAINS (IRON PIPE AND FITTINGS).

	48 in.	30 in.	24 in.	20 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	3 in.
Straight pipes, 12 ft. each	2	..	..	10	14	1	20	12	30	140	..
Bends	..	3	1	..	2	1	9	8	7	3	1
Y Branches	..	..	1	1–12	..	1	..	..	..	..	..
Sleeves	..	1	2	7	2	3	6	6	13	3	3
Clamp sleeves	..	..	4	4	3	4	6	8	4	5	5
Drain offsets	..	..	..	..	..	..	..	...	8	..	..
Offsets	..	..	..	..	..	..	6	4	11	13	..
Gates	..	..	..	..	..	..	..	1	3	4	2
Check-valves	..	..	..	..	..	..	1	..	..	..	..
Blow-off branches	..	..	3–6	2–6	..	..	..	..	..	..	..
Caps	..	..	..	...	2	..	..	2	5	6	..
Clamps for cement pipe	..	..	..	2	..	..	..	..	..	..	..
T's	..	1–6	1–24	1–20	1–6	3–8	3–8	..	5–6	5–4	2–3
"	..	..	4–6	1-16	...	1–6	12–6	..	3–4	..	..
"	..	..	..	1–12	..	..	..	..	..	..	..
"	..	..	..	1–10	..	..	..	..	..	..	..
"	..	..	..	2–6	..	..	..	..	..	..	..
Crosses	..	..	..	1–20	1–12	5–10	2–10	..	6–6	16–4	1–3
"	..	..	..	2–10	2–6	7–4	6–8	1–4	9–4	..	..
"	..	..	..	..	..	7–6	5–6	..	..	..	..
"	..	..	..	..	..	..	1–4	..	..	..	..
Reducers	..	..	1–10	1–12	1–8	..	1–8	..	5–4	..	2–4
"	..	..	..	1–10	1–6	..	2–6	..	..	..	..
"	..	..	..	1–8	..	..	..	..	..	..	..

FOR SUPPLIES (GALVANIZED PIPE AND BRASS FITTINGS).

	2-in.	1½-in.	1¼-in.	1-in.	¾-in.
Feet in length of galvanized pipe........	30	165	16	200	1,600
Elbows	30	34	8	60	60
Street elbows..................................	40	..	30	5	29
Couplings......................................	45	48	20	36	32
Unions..	27	38	41	60	36
Faucets...	..	..	..	13	20
Stop and waste................................	11	25	11	17	140
Screw-cocks....................................	4	23	7	1	105
Sidewalk cocks................................	..	..	..	23	198
Screw-cocks for cement pipe............	..	..	..	30	..
Blow-off cocks................................	..	11	..	44	24
Air-chamber....................................	..	..	..	..	..
Socket end of rod, 7........................	..	..	..	..	..
Nipples...	16	30	30	50	50
Plugs, different sizes, 80..................	..	..	..	..	..
Bushings, from 2-in. to ½-in., 225..........	..	..	..	..	..
Fountain cocks................................	..	..	..	..	7
Sill cocks.......................................	..	..	..	..	12
Hose nipples...................................	..	..	..	..	20
T's	30	27	70	20	96
Lot of cast-iron T's and crosses..........	..	..	..	..	..
Caps...	14	12	12	12	12
Reducing couplings from 2-in. to ½-in, 50	..	..	..	..	..
Stand pipes, 172..............................	..	..	..	..	..
Clips, 49	..	..	..	..	..
Lead connèctions, from 1¼-in to ¾ in., 8...	..	..	..	..	..
Hydrant cocks.................................	..	..	..	..	12
Check valves..................................	1	1	1	1	1
Cement cocks..................................	..	..	..	31	..

Stock in Shop and Yard.

3 hydrant-valves.
9 bolts for flush-hydrants.
25 stop and wastes for flush-hydrants.
4 lead-kettles.
3 furnaces.
4 ladles.
3 bench vises.
4 drinking-fountains.
8 bands for capping main pump.
1 meter-box.
1 iron gate box.
2 hydrant-boxes.
1 gate box (wooden).
7 small gate boxes.
3 cock boxes.
20 large frames and covers.
200 risers for boxes.
160 seals.
1 breast drill.
1 ratchet for tapping main pipe.
3 machines for tapping cement pipe.
1 washer cutter.
1 platform scales.
3 grindstones.
1 diaphragm pipe.
1 hand pump.
8 thawing pumps.
200 feet thawing-out pipe.
1 barrel clay.
1 small hatchet.
4 hoes.
1 hay cutter.
3 small derricks.
1 breast derrick.
11 pipe wrenches.
2 nut wrenches.
6 monkey wrenches.

24 nuts.
5 axes.
4 sledge hammers.
lot of old junk.
6 gallons oil.
1 pair long leg boots.
1 cord wood.
25 feet ¾-inch hose.
1 cask cement.
100 feet 2-inch hose.
6 screw-drivers.
3 saws.
1 floating hook.
1 large mall.
1 square.
Plane, compasses, etc., for carpentering.
A lot of counters and ratchet movements for meters.
A lot of lumber.
11 spindles for 4-inch and 6-inch gates.
5 horses.
6 wagons.
6 harnesses.
2 sleighs.
2 double-runner sleds.
8 blankets.
2 buffalo robes.
2 lap robes.
3 oil-coverings for horses.
1 lathe, with the usual chucks and tools.
1 water-motor.
1 threading machine, with dies complete.
1 drilling machine, with drills complete.
3 tapping machines for supplies, with taps and drills.
4 hooks for tapping main pipe.
2 2-inch taps and drills.
8 pipe cutters.
7 pipe tongs.
4 sets main pipe tools.
13 gate wrenches.
4 blow-off wrenches.
1 2-inch cock wrench.
400 block stones.
4 wooden horses.
10 oil cans.
8 die-plates, with dies complete.
4 tool chests.
2 hand carts.
3 chains.
95 shovels.
3 snow shovels.
30 picks.
14 trench rammers.
2 paving rammers.
8 pails.
4 iron bars.
20 wheelbarrows.
2 tamping bars.
1,400 pounds lead.
70 pounds packing.
4 hydrant bodies.
1 set hydrant tools.
3 rakes.
Lot old flush hydrants.
9 post hydrants.
19 post-hydrant rods.
5 hammers.
1 plough.
1 dray.
35 wooden plugs of different sizes.
Lot of blocks and wedges.
7 ¾-inch Worthington meters.
6 1-inch Worthington meters.
1 3-inch Worthington meter.
4 ¾-inch Union Rotary meters.
1 1-inch Union Rotary meter.
1 1-inch Ball and Fitts meter.
1 ⅝-inch Crown meter.

REPORT

OF THE

ENGINEER OF THE PUMPING STATION.

PUMPING STATION,
CAMBRIDGE WATER WORKS,
December 1, 1886.

Hiram Nevons, Esq., Superintendent:—

SIR:—During the past year the old boilers, which had been in operation since 1868, have been taken out and four new steel boilers put in place of them. The new boilers are made of "Otis steel," having a tensile strength of 60,000 pounds per square inch, an elastic limit of 37,000 pounds and an elongation of at least 20 per cent. in ten inches. A test piece from each plate was tested at the Otis Co.'s works, and the results forwarded with the plates. The boilers were built by William Campbell & Sons, of this city, and are a first-class job. We have now boiler capacity sufficient for running the three engines at the same time, and also have a reserve for cleaning or repairs.

The engines have not required any extensive repairs during the year, and are in good condition.

The auxiliary pumps at the pond, which were in operation at the date of last report, continued running until January 30, and were started again on October 24. Following will be found a statement of the expenses at the [pumping station, with the usual tables:—

EDWIN C. BROOKS.

Engineer.

STATEMENT.

$524\frac{1440}{2240}$ tons Cumberland coal at $4.18	$2,166 76
$359\frac{840}{2240}$ tons Cumberland coal, at $4.18	1,502 19
New boilers	2,408 17
Oil, Waste, packing, etc.	176 31
Repairs on engines	34 90
Repairs on buildings and care of grounds	432 27
Gas	101 48
Salaries	3,915 00
Total	$10,737 08

Engine Record, Pond Levels and Rainfall.

DATE.	LOW-SERVICE ENGINES.						HIGH-SERVICE ENGINE.						Total water pumped.	Daily average water pumped.	Total coal consumed.	Daily average coal consumed.	Av'age height of Pond.	Rain-fall.
	Total pumping time.		Daily average pumping time.		Total water pumped.	Daily average water pumped.	Total pumping time.		Daily average pumping time.		Total water pumped.	Daily average water pumped.						
	Hrs.	Min.	Hrs.	Min.	Gallons.	Gallons	Hrs.	Min.	Hrs.	Min.	Gallons	Gallons.	Gallons.	Gallons.	Lbs.	Lbs.	Feet.	Inches
December, 1885..	369	25	11	55	79,634,700	2,568,861	369	25	11	55	6,572,698	212,023	86,207,398	2,780,884	146,800	4,736	6.72	1.82
January, 1886....	447	50	14	27	96,280,200	3,105,813	447	50	14	27	8,083,910	260,771	104,364,110	3,366,584	177,900	5,739	7.18	6.41
February, 1886. .	444	40	15	53	97,287,300	3,474,546	444	40	15	53	7,755,072	276,969	105,042,372	3,751,513	174,400	6,229	10 56	7.35
March, 1886......	432	55	13	58	98,046,000	3,162,774	432	55	13	58	7,646,342	246,656	105,692,342	3,409,430	171,600	5,535	13.02	3.49
April, 1886.......	368	25	12	17	86,118,300	2,870,610	368	25	12	17	6,865,901	228,863	92,984,201	3,099,473	146,600	4,887	13.64	2.43
May, 1886........	401	15	12	57	95,597,100	3,083,777	401	15	12	57	7,782,758	251,057	103,379,858	3,334,858	157,200	5,071	13.30	3.92
June, 1886.......	422	35	14	05	99,709,200	3,323,640	422	35	14	05	8,389,382	279,646	108,098,582	3,603,286	168,800	5,627	12.54	1.48
July, 1886........	475	10	15	20	109,037,700	3,517,340	475	10	15	20	10,232,064	330,067	119,269,764	3,847,412	188,300	6,074	11.40	3.54
August, 1886.....	445	40	14	23	100,981,800	3,257,477	445	40	14	23	8,542,944	275,579	109,524,744	3,533,056	177,000	5,710	10.45	3.20
September, 1886.	417	00	13	54	95,278,800	6,175,960	417	00	13	54	7,994,342	266,478	103,273,142	3,442,438	165,500	5,517	9.26	4.64
October, 1886....	408	45	13	11	95,716,200	3,087,619	408	45	13	11	7,883,578	254,309	103,599,778	3,341,928	160,500	5,177	7.98	3.62
November, 1886..	373	30	12	27	86,940,000	2,898,000	373	30	12	27	7,182,586	239,419	94,122,586	3,137,419	145,600	4,853	7.28	4.22
Total	5,007	10			1,140,627,300		5,007	10			94,931,578		1,235,558,878		1,980,200			46.12
Daily Average...	13	43			3,125,006		13	43			260,067		3,385,093		5,425		10.27	

Stock on Hand December 1, 1886.

489 tons Cumberland coal, 40 gallons cylinder oil, 19 gallons engine oil, 42 gallons kerosene oil, 30 lbs. tallow, 50 lbs. cotton waste, 25 lbs. rubber packing, 5 lbs. Usidurian packing, 3 lbs. Asbestos packing, 10 lbs. Empire packing, 10 lbs. Winans packing, 18 manhole gaskets, 24 9-in. rubber valves, 2 valve seats, 2 steam gauges, 65 lbs. soap, 100 fire brick, 2 brooms, 15 ft. 5-inch rubber belting, ½ doz. files, 1 lb. emery, 2 bbls. brimstone, 300 lbs. bolts and nuts, 1 pair plungers and rings for No. 2 Engine, 1 lot iron pipe, 1 lot pipe fittings, 10 feet 24-inch flange pipe, 8 ft. 9-inch flange pipe, 8 ft. 6-inch flange pipe.

Tools, Furniture and Instruments.

1 18-inch x 10 ft. engine lathe, with chucks, tools, etc.; 1 3-inch x 9-inch engine, 1 lot shafting, belting and pulleys; 1 grindstone, 2 vises, 1 vise bench, 3 die-plates and dies, 1 set pipe taps, 1 set hand taps, 2 pipe cutters, 14 pairs pipe tongs, 3 hand hammers, 1 copper hammer, 18 cold chisels, 6 files, 1 hand bellows, 6 screw wrenches, 4 Stillson wrenches, 22 fork wrenches, 26 socket wrenches, 3 gate wrenches, 1 hydrant wrench, 2 clamp screws, 1 sledge, 2 ratchets, 24 drills, 1 breast drill, 2 jackscrews, 6 steel bars, 2 soldering irons, 4 cylinder head cranes, 12 eyebolts, 75 starting bolts, 1 chain fall, 3 tackles, 2 ladles, 4 wooden horses, 1 oil cabinet, 1 set measures, 1 lot oil cans, 1 oil pump, 1 carpenter's bench, 4 planes, 3 hand saws, 8 chisels, 7 gauges, 2 screw-drivers, 2 bit-stocks, 13 bits, 3 augers, 1 draw-knife, 1 spokeshave, 1 axe, 3 hatchets, 1 square, 1 set fire tools, 1 coal car, 1 pair platform scales, 2 wheelbarrows, 12 scoop shovels, 1 tube brush, 1 forge, 1 anvil, 5 pairs tongs, 2 handchisels, 1 lawn mower, 2 steel rakes, 2 wooden rakes, 2 scythes, 4 forks, 1 weeder, 1 spade, 1 pick, 1 cast-iron roller, 6 ladders, 3 step ladders, 200 ft. 2-inch hose and pipe, 100 ft. ¾-inch hose and pipe, 1 water cooler, 6 fire pails, 8 water pails, 1 watering pot, 1 window brush, 1 floor brush, 1 dust-brush, 1 feather duster, 1 dust-pan, 1 lot cocoa matting, 5 mats, 6 spittoons, 1 lot gas fixtures, 4 bracket lamps, 6 lanterns, 4 hand lamps, 1 desk, 2 tables, 2 clocks, 6 chairs, 1 barometer, 1 hygrophant, 1 thermometer, 2 rain gauges, 1 snow gauge.

Tools, Furniture, etc., at Engine House at Pond.

1 12 x 20-inch portable engine and boiler, 1 12 x 20-inch stationary engine, 1 40 H. P. locomotive boiler, 1 No. 2½ Blake pump, 1 12-inch centrifugal pump, 2 12-inch Follansbee propeller pumps, 1 Hancock inspirator, 1 lot shafting, pulleys and belting, 1 hand force pump, 100 ft. 1-inch fire-hose and pipe, 80 ft. 1-inch rubber-hose, 10 ft. ¾-inch steam-hose, 1 set fire tools, 2 oil cans, 2 squirt cans, 1 dip-net, 1 belt awl, 1 belt punch, 1 lot belt lacings, 2 bracket lamps, 2 lanterns, 1 large lantern, 2 chairs, 1 stove and pipe, 1 cot bed and bedding.

REPORT

OF THE

TRUSTEES OF THE SINKING FUND OF THE CAMBRIDGE WATER WORKS.

The undersigned, Trustees of the Sinking Fund of the Cambridge Water Works, herewith submit their annual report of the fund committed by law to their charge: —

Dr.

The amount of the fund at the last report, Nov. 30, 1885, was	$874,373 38	
The amount received during the year from the City Treasury of Cambridge, the same being derived from the annual water-rates and being equal to three per cent on the amount of outstanding Water bonds, was	57,675 00	
Amount received during the year as interest on investments, was	40,132 05	
Amount received during the year as premium on securities sold to change investments, was	6,332 50	
Amount received at the close of the year from the City Treasury, of surplus in the running accounts of the Water Works for 1886	13,589 34	
		$992,102 27

Cr.

Amount paid the Treasurer of Cambridge with which to meet the Water bonds maturing July 2, 1886	$100,000 00	
Amount paid as accrued interest on bonds purchased for investment	96 30	
Amount of the Fund Nov. 30, 1886, all securities taken at par	892,005 97	
		$992,102 27

The following is a list of the securities belonging to the fund, Nov. 30, 1886: —

Cambridge Water Loan, six per cent bonds, maturing April 1, 1887	$6,000 00	
Cambridge Water Loan, six per cent bonds, maturing April 1, 1888	25,000 00	
Cambridge Water Loan, six per cent bonds, maturing May 1, 1889	8,000 00	
Cambridge Water Loan, six per cent bonds, maturing July 1, 1890	31,000 00	
Cambridge Water Loan, six per cent bonds, maturing May 1, 1891	26,000 00	
Cambridge Water Loan, six per cent bonds, maturing July 1, 1892	1,000 00	
Cambridge Water Loan, four per cent bonds, maturing Nov. 1, 1894	6,000 00	
Cambridge Water Loan, six per cent bonds, maturing April 1, 1895	37,000 00	
Cambridge Water Loan, 3½ per cent bonds, maturing after April 1, 1896	100,000 00	
Cambridge Water Loan, 3½ per cent bonds, maturing after July 1, 1896	75,000 00	
Cambridge Water Loan, six per cent bonds, maturing July 1, 1896	46,000 00	
Cambridge Water Loan, six per cent bonds, maturing July 1, 1897	16,000 00	
Cambridge Water Loan, five per cent bonds, maturing July 1, 1898	12,500 00	
Cambridge Contingent Loan, four per cent note, dated Dec. 1, 1883	200,000 00	
		$589,500 00
Town of Southboro, four per cent bonds, maturing Mar. 25, 1887	$2,000 00	
Town of Southboro, four per cent bonds, maturing Mar. 25, 1888	2,000 00	
Town of Southboro, four per cent bonds, maturing Mar. 25, 1890	6,000 00	
Town of Hyde Park, four per cent bonds maturing July 1, 1891	5,000 00	
City of Salem, four per cent bonds, maturing July 1, 1892	17,000 00	
City of Fall River, four per cent bonds, maturing May 1, 1895	9,000 00	
Town of Arlington, five per cent bonds maturing July 1, 1898	30,000 00	
City of Boston, four per cent bonds, maturing Jan. 1, 1899	50,000 00	
Town of Pawtucket, five per cent bonds, maturing April 1, 1899	25,000 00	
City of Providence, 4½ per cent bonds maturing June 1, 1899	21,000 00	
Amounts carried forward	$167,000 00	$589,500 00

Amounts brought forward	$167,000 00	$589,500,00
City of Boston, four per cent bonds, maturing April 1, 1900	4,000 00	
City of Fall River, four per cent bonds, maturing Aug. 1, 1900	13,000 00	
City of Cleveland, O., $3\frac{65}{100}$ per cent bonds, maturing Sept. 1, 1902	3,000 00	
City of Lawrence, four per cent bonds, maturing July 1, 1904	18,000 00	
City of Providence, five per cent bonds, maturing July 1, 1906	50,000 00	
Town of Winchester, four per cent bonds, maturing May 1, 1908	10,000 00	
Town of Beverly, four per cent bonds, maturing July 1, 1911	20,000 00	
		$285,000 00
		$874,500 00
Cash in first National Bank of Cambridge		17,505 97
		$892,005 97

The fund is now earning an average rate of about 4¼ per cent.

The bonded water debt, which the foregoing fund is expected to pay, matures as follows, viz: —

April 1, 1887, six per cent coupon	$150,000 00
April 1, 1888, six per cent coupon	175,000 00
May 1, 1889, six per cent coupon	112,000 00
July 1, 1890, six per cent coupon	60,000 00
May 1, 1891, six per cent coupon	50,000 00
July 1, 1892, six per cent coupon	335,000 00
April 1, 1894, six per cent coupon	150,000 00
Nov. 1, 1894, four per cent coupon	36,000 00
April 1, 1895, six per cent coupon	160,000 00
April 1, 1896, 3½ per cent registered (or at option of City April 1, 1911)	100,000 00
July 1, 1896, six per cent coupon	103,000 00
July 1, 1896, 3½ per cent registered (or at option of City July 1, 1911)	75,000 00
July 1, 1897, six per cent coupon	16,000 00
July 1, 1898, five per cent registered	12,500 00
Nov. 1, 1906, 3½ per cent registered	43,000 00
May 1, 1910, four per cent ($155,000.00 coupon, $133,000.00 registered)	288,000 00
	$1,865,500 00

The features of the year have been the payment of $100,000.00 of six per cent water bonds which matured July 2, 1886, and the changes made in our investments by the sale of certain city and town bonds, and the purchase from the Finance Committee of the City Council of $175,000.00 of Cambridge Water bonds bearing 3½ interest, issued during the year just closed. These bonds just issued are not due until the year 1911, unless the City Council should deem it advantageous for the City to pay them earlier, in which event they can be paid any time after 1896.

Notwithstanding $100,000.00 of water bonds have been paid during the year, this fund is larger by over $17,000.00 than it was at the beginning of the year. The net water debt at this date is $978,494.08.

WM. E. RUSSELL, JOHN H. CORCORAN, WM. W. DALLINGER,	*Trustees of the Sinking Fund of the Cambridge Water Works.*

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